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VOL. XXVII. JULY, 1912. No. 1.

One of the significant educational developments of recent years has been the increasing recognition accorded to instruction in home economics. Although the term itself was unfamiliar a generation ago, at the present time home economics courses are being offered in this country in more than twelve hundred institutions, of which over two hundred are colleges and normal schools. Thirty-five of the land-grant colleges for white students are among the number, and twenty-seven of these offer four-year courses leading to degrees. Extension work has likewise been well organized in many of the States, largely with a view to reaching the women on the farm. In short, home economics instruction is already emerging from the pioneer stage and becoming an accepted factor in American education.

One of the principal obstacles which educators are encountering in their efforts to reduce the subject to sound pedagogical form is the comparatively retarded development of experimental work. It is well recognized that, as is the case with agriculture and other composite branches of learning, home economics is largely a specific application of the principles of chemistry, bacteriology, physics, and other sciences; but, as is also the case with agriculture, there are required to make it most effective special investigations and experiments, made from the standpoint of those who appreciate the needs and use to be made of such information.

Considering home economics as including the economic, sanitary, and esthetic aspects of food, clothing, and shelter as connected with their selection, preparation, and use by the family in the home or by other groups of people, it is a matter of everyday knowledge that many of its practical applications are still largely governed by rule-of-thumb or by tradition. For example, the laws of heat are well understood in the scientific world, but their application to cookery, food preservation, or the heating of houses needs far more investigation than it has thus far received. The present is preeminently the era of machinery, but the improvement of household appliances has

been left almost entirely to commercial exploitation, and progress has admittedly lagged far behind achievements in the factory and on the farm. Yet if there are to be reliable comparisons of the merits of different foods or textiles, or of different labor-saving or sanitary devices, there must be scientific tests by those familiar with the housekeeper's needs and competent to work out her problems.

The need of these studies is becoming the more imperative because of the increasing complexities of modern life. It is even more important now than it was a few years ago that there should be a scientific basis for instruction on how food materials can be best utilized in family diets, how houses should be constructed, furnished, and managed, and what materials are most suited for clothing, because of late years there has been less and less opportunity to acquire experience in such matters in the home itself. Two or three generations ago each home, and especially each rural home, was practically self-sufficient, producing not only its own food supply, but, to a certain extent, its own clothing, and constructing its buildings in such a simple way that any intelligent and experienced laborer could understand the principles involved. Now, however, a great many branches of work which were formerly home industries have been taken over by factories or by specialized workers, and there is no longer the opportunity to learn about them by practical trials in the home. In many cases such knowledge as is available is still, to a certain extent, handed down in an empirical way from mother to daughter, but in many others it would soon die out entirely did not schools or other educational agencies supply it, and these must acquire exact knowledge before they can transmit it.

It is true that many of the problems encountered are more or less isolated in application, and that much can be accomplished by individual initiative within the home. But it is as unreasonable to look to the farmer's wife for progress along technical lines, as to rely on the farmer to work out the fundamental principles of his art. As is pointed out by a recent writer on the subject, such knowledge as the housekeeper has "is in reality a by-product of a vast number of unrecorded and half-observed events. For the more exact and vastly more economical gathering of knowledge, by methods known to the laboratory, the housewife lacks the training and the outfit, especially the instruments of precision. Above all, she presides not over a laboratory, products of which are considered of no value except for teaching purposes, but over a factory the output of which—good food, clean and attractive rooms, suitable clothing, and all the rest—must not fail. By any methods known to her, usually those she has inherited, she must bring some semblance of these results to pass, and that daily."

Just as the trained experimenter was needed for the conversion of agriculture from a traditional to a scientific basis, all that relates to hygiene and household methods and the host of related questions demands careful study by experts having proper equipment for the undertaking.

Fortunately the dependence of home economics instruction upon research is becoming generally understood, and the belief that housekeeping is largely a matter of inspiration and feminine intuition, with no need of an accumulated store of information to draw upon, is rapidly giving way to the modern view that "a knowledge of housekeeping is not a matter of sex but of science." Nearly fifteen years ago the Secretary of Agriculture, in the Yearbook for 1897, pointed out that "the teachers of domestic science are not content to follow a dull routine of household drudgery in their teaching. They are appealing to the scientist and specialist in lines which touch the home life to explain the principles on which home practices should rest, and to show them how intelligent taste and skill can make the home a pleasant place to live in, and how scientific knowledge can enable the home-keeper to maintain the health and generally promote the physical well-being of those committed to her charge. Some progress has been made in formulating the replies which science is now able to give to inquiries relating to domestic science, and in undertaking investigations with a view to greatly broadening our knowledge of these matters in the days to come."

In the interval which has elapsed since these words were written much additional attention to research in problems affecting the home has been given, to some extent by home economic workers themselves and even more largely by scientists in associated lines. Agriculture in particular has contributed most valuable assistance, the community of interests between the production of food supplies, textiles, and other farm products and their utilization within the home being generally recognized.

Most of the agricultural experiment stations have from time to time studied problems which have to do with the handling, storing, and marketing of foods, while many have had to deal with food and drug inspection. They have also studied many technical as well as practical problems of milling and dairying, and other problems which pertain to the home as distinguished from the farm as an industrial enterprise. Of such work may be mentioned studies of the composition and digestibility of foods, numerous studies of cooking processes and of canning, dietary studies, the improvement in quality of cotton, flax, and wool, studies of household equipment and conveniences, and the cost of board for laborers on farms.

An important service has also been rendered by the engineering experiment stations established at several of the land-grant institu-

tions. Comparisons of different illuminants and fuels, and studies of sewage disposal plants and of building materials, may be cited as types of the work already undertaken.

It is well known that the Department of Agriculture has made a large number of contributions, the activities of nearly every bureau containing much of interest. The intimate connection of much of the work of the Bureau of Chemistry, the Bureau of Animal Industry, and the Bureau of Plant Industry is obvious, but there may also be mentioned the studies of household insects in the Bureau of Entomology, the utilization of woods by the Forest Service, some of the economic studies of the Bureau of Statistics, and a study in the relation of high altitude to cookery reported by the Weather Bureau. The nutrition investigations of this Office are, of course, accepted as fundamental by home economics educators, and the publications issued as part of the work are widely utilized as texts.

The contributions of home economics workers themselves have been numerous and meritorious, especially in view of the comparative newness of the subject and the lack of organized research agencies. The attention which is being concentrated on the preparation of research workers is yielding results of much promise, and the list of additions to knowledge in the form of theses for advanced degrees is each year becoming more impressive.

Contributions from the more mature workers actively engaged in instruction duties are even yet relatively few. This of course is unfortunate, since their qualifications and experience would seem to promise results of exceptional value. It is not, however, particularly surprising, for as was recently pointed out, "under present conditions, the task of the college teacher of home economics is a very difficult and complicated one. By study and research she must assemble and enlarge a new body of knowledge and give it pedagogical form. She must prepare manuals, text-books, apparatus, and illustrative material in this new subject. . . . Besides giving sound and thorough instruction to her college students, she must do a large amount of propaganda work to secure the general recognition of home economics in the elementary and secondary schools, and all she can of that broader extension work by which the multitudes of untrained women in the homes are to be encouraged and inspired."

Notwithstanding these difficulties, to which may be added those imposed by an absence of funds for research and often of equipment, the uncertainties as to the publication of results, and the lack of many other advantages enjoyed by a regularly organized research institution, it is believed that there are many opportunities for adding to the store of knowledge by the use of existing facilities. If home economics embodies, as has been stated, "the utilization of

all the resources of science to improve the home life," then the chemist, the physicist, and the economist may each be expected to contribute his share. Studies corresponding, for instance, to those recently reported from the department of bacteriology of the University of Wisconsin on the sanitary value of vacuum cleaners and on the preservative action of various spices, would doubtless occur to many a worker in these related sciences, and if brought to completion would be assured of immediate application.

Oftentimes, too, investigations already under way at the experiment stations may be legitimately extended to throw light on those phases of particular interest to the home. In other cases there may be cooperation with home economics departments to their mutual advantage. A study of this type was completed some time ago at the University of Missouri. Here the meats produced under controlled conditions in connection with nutrition studies of the station were utilized by a graduate student in home economics for an inquiry as to the relative economy of various cuts of beef.

An interesting development of recent years has been the establishment of commercial "housekeeping experiment stations." These have thus far given particular attention to household appliances, but the idea could doubtless be more widely extended.

The responsibility for real progress in research, however, must rest largely with the home economics departments. Whatever the assistance rendered by other agencies, the upbuilding of a distinctive body of home economics knowledge must come mainly from investigations by the home economics workers themselves, rather than through the mere adaptations of either traditional methods or "borrowed science." It is well known that this has already been the experience in agriculture, and the close analogy between the two studies warrants the prediction that the future of home economics instruction depends very largely upon its establishment on a sound scientific foundation by those to whom its development has been specifically intrusted.

Doubtless in many cases the undertaking of comprehensive investigations by home economics instructors is impracticable under present conditions, but as in the early days of agricultural instruction, there are a host of smaller projects awaiting and needing solution for which opportunity might be found. For instance, in the field of textiles, there may be cited studies of the relative durability of different fabrics as affected by such controllable conditions as the kind of material, its thickness, and its closeness of weave; the testing of various solvents in removing stains from fabrics; and the comparison of soaps and detergents in different waters and temperatures. There might well be additional studies of the comparative cost of household

fuels and illuminants, of the use of nonconducting materials in stoves and other cooking utensils, and of the solubility of kitchen ware in different waters, fruit acids, and other liquids. The preparation of systems of household accounts and the investigation of the lessening of the time requirements of household operations, the actual loss incurred by the purchase of supplies in uneconomical quantities and the incomplete utilization of "left overs," are other examples, such as will readily suggest themselves to the thoughtful observer. Many of these studies might readily be carried through during the long summer vacation, and others demand regular attention rather than large amounts of time.

In many of these cases not the least of the benefits to be secured would be the stimulation of the research spirit of the teacher, for the generally accepted opinion of President Jordan of Leland Stanford University that "no one can be a great teacher without the spirit of research; without this he lags behind the progress of knowledge and his mental equipment becomes second hand," is as applicable to home economics as to other subjects of instruction. There is also the same broadening and stimulating effect on advanced students in home economics as on those in other lines.

The increasing attention which is being devoted to the more thorough training of prospective teachers in research methods is a recent development which augurs well for the future. The steadily improving facilities for graduate study, the numerous summer schools now available, and in particular the inspiration of the Graduate School of Home Economics, which has just completed its fourth session at the Michigan State Agricultural College in close association with the Graduate School of Agriculture, are destined to add greatly to the ultimate efficiency of home economics instruction and experimentation. Once the inculcation of the spirit of research into the investigators of to-morrow can be accomplished, the establishment of home economics as a well-defined science will be assured, and its consistent development may be confidently awaited.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

A study of humus in Hawaiian soils, W. P. Kelley and W. McGeorge (*Hawaii Sta. Press Bul. 33, pp. 23, fig. 1*).—While studying Hawaiian soils as regards their humus content it was found that those soils obtained from the upper islands, which had a varied physical structure and in some instances a high percentage of clay and silt, gave unreliable results with the official method. As the clay in these soils could not be removed by any other means than by using the Cameron-Breazeale-Alway clay filter method (E. S. R., 24, p. 9), the authors made an effort to overcome the difficulties which attend its use.

This was done by drawing the solution through the filter in the reverse direction from that usually employed. For the compression chamber was substituted an ordinary suction pump. "The tube of glazed porcelain, attached to the lower end of an 8-in. Pasteur-Chamberland tube, was broken off so as to leave this end of the tube open; then the tube was inserted into the upper opening of a bell jar, such as is used for filtering with suction, in a manner similar to that employed in the use of a Gooch. A large part of the tube was allowed to extend into the filtering jar and the connection was made air-tight by means of a short piece of Gooch tubing or a rubber stopper. It was also found desirable to coat the upper portion of the tube with paraffin so as to prevent the passage of the solution except in the lower half of the filter tube, otherwise the solution will pass down the side of the bell jar.

"A 50 cc. aliquot of humus solution (the preliminary extractions with hydrochloric acid were made by digesting 10 gm. of soil in 200 cc. of fifth-normal hydrochloric acid at ordinary laboratory temperature for 5 hours, filtering, and washing free from acid with distilled water, as outlined by Fraps in his directions for cooperative study of humus determination for the Association of Official Agricultural Chemists, May, 1911), which represented 1 gm. of soil, was drawn through the tube by means of reduced pressure, the filtrate being collected in a short cylinder. After the entire aliquot was drawn through, a 4 per cent solution of ammonia was then passed through so long as it showed any color. Usually about 200 cc. was required. In no instance was it found necessary to use more than 250 cc. The filtrate and washings were then evaporated to dryness and the determinations completed as usual.

"Some difficulty was experienced in completely removing the clay in certain soils. There was found to be considerable difference in different tubes in this respect. Some filters will remove all clay, while others seem to allow a small amount of the most finely divided clay to pass through. . . .

"The time required to complete a filtration was found to be about 3½ hours, and by arranging a number of filtering jars in a series an ordinary Richardson pump will provide suction for at least 3 filters, and with close-fitting con-

nections it is probably possible to operate ½ doz. filters with one pump. In any event, at least ½ doz. solutions can be filtered in one day by this apparatus."

"After each filtration the tube should be washed out. A test-tube brush was found to be serviceable in removing the clay from the inner walls of the filter tube."

The results obtained show that the modified clay filter method yields higher results than either the Hilgard, Mooers-Hampton, or the Cameron-Breazeale method, and lower results than the Rather and official methods. The latter 2 methods, however, could not be relied upon as far as Hawaiian soils are concerned. The Rather method in most instances did not bring about a coagulation of the clay. On the other hand, although the results obtained with the Mooers-Hampton, Hilgard, and Cameron-Breazeale methods at times furnished concordant results, on the whole they were found to be in disagreement.

It was furthermore noted that as much as 4 gm. of ammonium carbonate per 100 cc. of soil extract was necessary to effect a complete coagulation of the clay with the Rather, Rather modified, and the modified clay filter methods. In some instances, however, a partial precipitation of humus also took place with the Rather methods. Organic matter was precipitated with all the methods. The fundamental reason for the differences in coagulability of the clays seems to lie in the fact that the clays under examination were different in composition. The uncoagulated suspensions were always found to contain relatively more iron and correspondingly less aluminum. The iron and aluminum in such solutions were found to be present in about the proportions necessary for the formation of a double silicate.

The detection of nitrates with diphenylamin, H. Caron (*Ann. Chim. Analyt., 16 (1911), No. 6, pp. 211–215; abs. in Chem. Zentbl., 1911, II, No. 6, p. 390*).—The diphenylamin reaction for nitrates was found to depend upon the concentration of the diphenylamin and sulphuric acid and the temperature. The reaction was more pronounced if the diphenylamin was present in small quantities and concentrated sulphuric acid was used in the test.

The test is best conducted by adding to 1 volume of the solution containing the nitrate 2½ volumes of a 0.002 per cent diphenylamin solution in concentrated sulphuric acid. The presence of hydrochloric acid or chlorids will not affect the reaction if concentrated sulphuric acid is used. If, however, diluted reagents are employed the presence of a drop of hydrochloric acid will render the reaction more sensitive. Glycerin, acetone, carbohydrates, salicylic acid, phenol, etc., destroy the intensity of the reaction more or less, particularly if the reagent employed has been prepared with concentrated sulphuric acid. When these substances are present the reagent must be prepared with hydrochloric acid.

The determination of nitrogen in commercial ammoniates, P. Rudnick et al. (*Jour. Indus. and Engin. Chem., 3 (1911), No. 10, p. 783*).—This is the second report of the committee on nitrogen, which was appointed by the division of fertilizer chemists of the American Chemical Society. It contains the reports of 15 analysts who determined the nitrate nitrogen according to the modified Gunning-Kjeldahl method and the moisture, using 2 gm. samples of fertilizer.

A wide range in the results on both moisture and nitrogen was reported, and no definite conclusions could be drawn. Local conditions of manipulation and reagents were deemed probably responsible for as much variation as any other factor. A further study of the subject with a view to the establishment of a standard sample is recommended.

An apparatus for preparing ammonium citrate solution. G. Vecchi (*Staz. Sper. Agr. Ital., 44 (1911), No. 1, pp. 56, 57, fig. 1*).—A simple apparatus, which

can easily be constructed in the laboratory, for preparing as much as 5 liters of ammonium citrate solution at one time is described.

A critical study of methods for determining the hardness of natural waters, J. M. SILBER (*Arch. Hyg., 73 (1911), No. 2, pp. 171–182*).—Wartha's method[1] for determining the transitory hardness, when modified according to the author's specifications, yields good results, but otherwise leads to error.

In regard to the determination of proteins and the digestion of protein by pepsin, F. WESTHAUSSER (*Hoppe-Seyler's Ztschr. Physiol. Chem., 72 (1911), No. 5–6, pp. 363–373; abs. in Zentbl. Physiol., 25 (1911), No. 16, p. 673*).—Determinations of proteins by Stutzer's method and by precipitation with tannin generally yield the same result. The methods can also be used for separating protein from amid nitrogen. On the other hand, varying results were obtained when the methods were used for separating the cleavage products resulting from the action of pepsin on protein. Identical results were obtained in fecal analyses.

The measurement of the oxidase content of plant juices, H. H. BUNZEL (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 238, pp. 40, pls. 2, figs. 9; Jour. Amer. Chem. Soc., 34 (1912), No. 3, pp. 303–316, figs. 2*).—Inasmuch as practically all of the tests heretofore reported for studying the activity of plant oxidases are of a more or less qualitative nature, a new method is described in which the oxygen is absorbed by pyrogallol through the agency of the plant juice, and the carbon dioxid developed is determined with sodium hydroxid. The oxygen absorbed is noted by means of the manometer.

The apparatus employed in the method is as follows: (a) A compact oxidase apparatus constructed entirely of glass, and with which it is possible to conduct the entire reaction, that is, oxygen and carbon dioxid absorption in the same apparatus (the apparatus also has connected with it a graduated apparatus for adding the reagents and the plant juice without disconnecting in any way); (b) a compact titration apparatus for determining the amount of carbon dioxid absorbed by the sodium hydrate solution; and (c) an electrically heated and controlled thermostat for conducting the oxidase reactions under uniform temperatures and conditions. The thermostat also contains a shaking device.

Some tests with the apparatus and potato peelings for furnishing the oxidase preparation, and some with normal beet leaves and others affected with curly top disease, are recorded, and which show that the apparatus furnishes concordant results.

On the determination of dry matter in roots, H. GOLDSCHMIDT (*Mælkeritid., 25 (1912), Nos. 1, pp. 12–15; 2, pp. 33–38; 3, pp. 63–70, figs. 4*).—A new method of determining the dry matter content of roots is described, and the apparatus used is illustrated. Samples weighing about ½ kg. are ground and dried in a specially constructed drying apparatus at steam heat for a period of from 48 to 72 hours, according to the number of samples being dried. Comparative results obtained with samples of different sizes are reported, showing a general agreement to within a few hundredths of 1 per cent.

A study of the carbohydrates in the prickly pear and its fruits, R. F. HARE (*New Mexico Sta. Bul. 80, pp. 30*).—This is a continuation of previous work (E. S. R., 19, p. 65). Among other objects, this investigation was to determine the composition of the mucilage, which this plant contains during its cycle of growth but which disappears at the ripening period, with a view of ascertaining its function and its possible economic uses.

"The juice of the ripe fruit contains 1.57 per cent of pentosans and only traces of galactan. When previously precipitated with lead acetate, the juice

[1] Ztschr. Angew. Chem., 15 (1902), No. 9, p. 198.

gave the anilin acetate reaction for pentose, but none for galactose. The presence of fructose and glucose in considerable amounts was quite definitely established by several reactions characteristic of these sugars.

"The dried mucilage of the prickly pear, when separated by precipitation with alcohol from a 2 per cent solution, contained 15 per cent of galactan, 31 per cent of pentosan, and 12 per cent of ash.

"The mucilage could not be separated completely from cell fragments, starch, crystals of calcium oxalate, and other solid particles that caused opalescence and turbidity. A dilute solution with 1.5 per cent of total soluble solid matter, rendered fairly clear by repeated filtration through silk, had no effect on polarized light. This was true of all the solutions of mucilage obtained in this work, both before and after subjecting them to acid hydrolysis. . . .

"Hydrolysis of the mucilage by digestion for several hours with 1.25 per cent sulphuric acid solution produced a sugar that had properties similar to arabinose. When its osazone was formed, oily globules rose to the surface. The precipitate was darker than glucosazone, readily soluble in hot water, and melted at near 160°.

"A 95 per cent alcoholic extract of the dried stems, previously treated with ether, contained a sugar with specific rotations made on three separate solutions of —6.6°, —8.25°, and —7.1°. The osazone produced from this sugar had properties similar to those of glucosazone. These results indicate the presence of mixtures of glucose and fructose in this extract.

"A 60 per cent alcoholic extract of the dried stems contained a substance apparently intermediate in character between mucilage and sugars. It did not reduce Fehling solution before hydrolysis, but was very readily hydrolyzed by dilute acids. Alcohol stronger than 60 per cent reprecipitated this material as a flocculent mass, quite different in appearance and properties from the precipitate of the mucilage with alcohol. The precipitate was readily soluble in water, but its solution was not mucilaginous. When hydrolyzed it gave a plus rotation to polarized light.

"The coloring matter can be concentrated and made into a marketable product, of value for coloring certain foods, by first removing mucilages and gums with alcohol, and precipitating the pigment from the filtrate with acetone.

"The pigment is evidently a glucosid. When separated from the juice with alcohol and acetone, and then precipitated with lead acetate, the coloring matter liberated by sulphuric acid gave a sugar on hydrolysis, with properties similar to those of glucose.

"The lead salt produced by precipitating the purified pigment with lead acetate contains 61.42 per cent lead."

A solution of the gum, while very viscous, possesses only a very low degree of adhesiveness.

The analysis and composition of grapes, R. Brunet (*Rev. Vit., 37 (1912), No. 942, pp. 15–20*).—This is a discussion in regard to the variations in the chemical composition of grapes during the cycle of growth. It includes analyses of the stems, skin, pulp, and seeds.

The composition of the apple as affected by irrigation, C. E. Bradley (*Jour. Indus. and Engin. Chem., 3 (1911) No. 7, pp. 496, 497*).—Apples which were grown on irrigated soil were found to be somewhat higher in moisture, higher in sugar, and lower in solids than the samples which were obtained from the dry check plats. The apples were also larger, but the individual apples from a given space showed very little variation among themselves. The protein content of the peelings showed an average of 0.7 per cent and that of the edible portion only 0.2 per cent. Traces of starch were present in the samples tested.

Investigations in regard to the composition of pear and apple seeds, P. Huber (*Landw. Vers. Stat., 75 (1911), No. 5–6, pp. 443–461*).—A qualitative and quantitative study of pear and apple seeds, with particular reference to the oil, proteins, and carbohydrates which they contain, is summarized below:

Composition of pear and apple seeds.

	Pears (Theiler).			Pears (Reinholz).			Apples (Uster).		
	Decorticated seeds.	Hulls.	Whole seeds.	Decorticated seeds.	Hulls.	Whole seeds.	Decorticated seeds.	Hulls.	Whole seeds.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Weight relation of decorticated seeds and hulls:									
In air-dry condition	58.90	41.10	100.00	68.70	31.30	100.00	62.50	37.50	100.00
After drying in water bath	58.84	36.53	92.37	64.36	28.46	92.82	58.44	33.53	91.97
In 100 gm. of dry substance:									
Fat (without lecithin)	36.46	7.13	24.84	33.14	7.10	25.15	32.70	8.99	24.03
Sugar (as invert sugar)	4.51	6.08	5.13	5.49	5.89	5.62	3.26	3.70	3.42
Pentosans	3.07	11.97	6.72	3.37	14.28	6.72	2.53	13.44	6.66
Crude fiber (nitrogen ash-free)	2.01	24.47	10.90	2.14	18.48	7.15	1.47	21.98	8.96
Nitrogen	7.77	1.64	5.34	8.29	1.83	6.31	8.45	1.78	6.02
Ash	4.70	2.50	3.83	5.04	2.31	4.19	4.77	2.11	3.79
Phosphorus	.....	.....	.....	1.07	.....	.....	1.01	.....	.....
Carbohydrates (sugar):									
(*a*) Alcohol-soluble, reducing	.....	.14	.....	(.10)	(1.58)	.....	(0.17)	(1.92)	.....
Alcohol-soluble, after inversion	3.36	1.53	2.63	3.82	2.85	3.53	2.63	3.30	2.87
(*b*) Water-soluble after inversion	1.15	4.55	2.50	1.67	3.04	2.09	.63	.40	.55
(*c*) Dissolved by boiling with dilute HCl acid (includes pentosans)	.....	11.87 (8.10)	.....	.....	13.99 (9.60)	.....	.....	11.52	.....
Nitrogenous substances:									
(*a*) Protein nitrogen	7.21	1.53	4.96	7.79	1.70	5.92	7.68	1.38	4.87
(*aa*) As protein (factor 5.55)	40.03	8.48	27.53	43.26	9.41	32.87	42.60	7.66	27.05
(*b*) Basic nitrogen	.30	.0	.21	.27	.09	.22	.41	.....	.....
(*c*) Amygdalin nitrogen	.....	.....	.....	.....	.....	.....	.03	Trace.	.....
(*cc*) As amygdalin (factor 32.77)	.....	.....	.....	.....	.....	.....	1.01	.07	.67
Phosphorus compounds:									
(*a*) Phosphorus in organic phosphates	.....	.....	.....	.....	.....	.....	.38	.....	.....
(*b*) Phosphorus in organic phosphatids	.06	.032	.048	.04	.03	.032	.05	.02	.04
(*bb*) As lecithin (factor 26)	1.51	.820	1.230	1.04	.66	.82	1.25	.51	.99

The hydrocyanic acid content of some seed and stone fruits, P. Huber (*Landw. Vers. Stat., 75 (1911), No. 5–6, pp. 462–482*).—The seeds of most of the pears which grow in Switzerland contain practically no amygdalin (less than 1 mg. in 100 gm.), but traces of emulsin-like enzyms, the activity of which is 100 times less than that of those present in sweet almonds. Apple seeds, on the other hand, contain from 0.62 to 1.38 per cent of amygdalin, calculated to dry substance, which corresponds to from 0.037 to 0.082 per cent of hydrocyanic acid. Sweet apple seeds (Uster) contained the least of those examined, while Holz contained the most. Apple-quince seed contained from 1.18 to 1.23 per cent of amygdalin, pear-quince seeds from 1.18 to 1.24 per cent, and the seeds of the Japanese quince (*Cydonia japonica*) 2.29 per cent.

Stones of the following fruits were also examined and showed amygdalin contents as follows: Black cherries (*Prunus avium*) 1.72 per cent, blue plums (*P. insitiicia*) 4.33 per cent, plum (Reineclaude) 5.03 per cent, German prunes (*P. domestica*) 2.52 per cent, Welch prunes (*P. domestica*) 4.32 per cent,

apricots (*P. armeniaca*) 0.11 per cent, luizet (*P. armeniaca*) 0.29 per cent, and peaches (*P. persica*) 2.63 per cent.

By macerating the ground seeds for 3 hours in water, and then distilling, fairly constant values can be obtained for hydrocyanic acid having its origin from the amygdalin or other glusosids through the interaction of emulsin contained in either the stones or seeds of fruits. About one-ninth of the hydrocyanic acid which can be theoretically obtained is converted into formic acid.

Analysis of mustard flour, A. DOMERGUE (*Jour. Pharm. et Chim., 7. ser., 4 (1911), No. 11, pp. 494–496, fig. 1; abs. in Analyst, 37 (1912), No. 431, pp. 55, 56*).—On estimating the amount of mustard oil in mustard flour it is necessary to keep the distilling vapors from coming in contact with the rubber connections. Accordingly, the author uses an apparatus in which one end of the condenser is connected with the flask by means of a ground glass stopper, while the other end is bent downward at a right angle and dips into a graduated cylinder. The distillate is collected according to Lenormand's method, 20 cc. of deci-normal silver nitrate solution being added, and the solution made up to a bulk of 100 cc. The rest of the procedure is the usual one.

Commercial mustards usually contain from 0.2 to 0.9 per cent of oil. The French codex requires 0.7 per cent as a minimum for black mustard seed.

A recently discovered bacterial decomposition of sucrose, W. L. OWEN (*Jour. Indus. and Engin. Chem., 3 (1911), No. 7, pp. 481–486*).—Previously noted from another source (E. S. R., 25, p. 110).

A new method for estimating sugar, F. VON FILLINGER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 22 (1911), No. 10, pp. 605–607, fig. 1; abs. in Analyst, 37 (1912), No. 431, pp. 63, 64; Ztschr. Angew. Chem., 25 (1912), No. 9, p. 431*).—Three solutions are required: (a) 250 gm. of potassium sulphocyanate, 250 gm. of potassium carbonate, and 25 gm. of potassium bicarbonate in 1 liter; (b) 4.278 gm. of copper sulphate in a liter; (c) 200 gm. of potassium sulphocyanate, 250 gm. of potassium carbonate, 50 gm. of potassium bicarbonate, and 10.42 gm. of copper sulphate in a liter, and filtered. In the flask (vented) described 20 cc. of each of the solutions (a) and (b) are placed and brought up to the boiling point, and from the burette the sugar solution is added until the color is discharged. Solution (c) serves as a preliminary test to determine the concentration of the sugar solution approximately.

Extraction of grains and cattle foods for the determination of sugars: A comparison of the alcohol and the sodium carbonate digestions, A. H. BRYAN, A. GIVEN, and M. N. STRAUGHN (*Jour. Indus. and Engin. Chem., 3 (1911), No. 7, pp. 486–497*).—Previously noted from another source (E. S. R., 25 p. 110).

Detection of salicylic acid, H. C. SHERMAN and A. GROSS (*Jour. Indus. and Engin. Chem., 3 (1911), No. 7, pp. 492, 493; abs. in Ztschr. Angew. Chem., 25 (1912), No. 9, p. 431*).—To the solution to be tested from 4 to 5 drops of a 10 per cent potassium or sodium nitrite solution, from 4 to 5 drops of a 50 per cent acetic acid solution, and 1 drop of a 1 per cent copper sulphate solution are added. After each addition of the foregoing reagents the mixture is shaken. The mixture is then placed in a boiling water bath for 45 minutes, cooled, and the red color obtained when as little as from 0.005 to 0.01 mg. of salicylic acid is present noted against a white background. Where larger amounts of salicylic acid are present a stronger solution of copper sulphate is necessary.

In regard to the differences in the cleavage of casein, paracasein, and calcium paracaseinate of cow's and goat's milk by trypsin and pepsin, J. HÖSLI (*Über Unterschiede in der tryptischen und peptischen Spaltung des Caseins, Paracaseins und des Paracaseinkalkes aus Kuh- und Ziegenmilch. Inaug. Diss., Univ. Bern, 1910, pp. 31*).—Casein and paracasein from cow's milk in vitro were found to behave alike toward trypsin. Paracasein is cleaved more thoroughly

by pepsin-hydrochloric acid than casein. The casein and paracasein from goat's milk reacted in the same manner as those from cow's milk.

Boiling test, alcohol test, and acidity degree of milk, O. RAMMSTEDT (*Ztschr. Offentl. Chem., 17 (1911), Nos. 23, pp. 441–455; 24, pp. 467–471; abs. in Ztschr. Angew. Chem., 25 (1912), No. 9, p. 436*).—No definite relation exists between the alcohol coagulation and the acidity of milk, but, on the other hand, the boiling, alcohol, and acid tests are of value as preliminary tests for milk hygienic work. Milk obtained under cleanly conditions has better keeping qualities than either pasteurized or raw market milks. The rennet, fermentation, catalase, reductase, and leucocyte tests are valuable in detecting impure milks.

The guaiac test for distinguishing between raw and boiled milk, K. SCHERN and W. SCHELLHASE (*Berlin. Tierärztl. Wchnschr., 27 (1911), No. 48, pp. 868, 869*).—As all guaiac tinctures do not serve as reagents for distinguishing raw milk from boiled, the author proposes a formula for preparing a reagent which will give a positive intense blue coloration when raw milk is present. This formula consists of resin. guajaci 10 gm., guajacoli 10 gm., perhydrol (3 per cent) 1 drop, and absolute alcohol 80 gm. This is termed the guaiac-guaiacol test. The use of the test in foot-and-mouth disease and tuberculosis is also considered.

Is the blue coloration obtained with tincture of guaiac an accurate indication that milk has not been boiled? H. TEWES (*Molk. Ztg. [Hildesheim], 25 (1911), No. 79, pp. 1499, 1500*).—If a brown color is obtained with the guaiac test, the milk in all probability has been boiled. If, on the contrary, a violet or blue coloration is obtained it is necessary first to determine whether some oxidizing agent or water has not been added to the milk. Boiled milk subsequently contaminated with bacteria or mill dust will also give a positive reaction.

The Schardinger reaction for milk, W. RULLMANN (*Biochem. Ztschr., 32 (1911), No. 5–6, pp. 446–472*).—Milk containing micro-organisms and thermostable bodies and milk free from them decolorize together or alone Schardinger's methylene blue-formalin solution in a few minutes at temperatures varying from 45 to 50° C. The formaldehyde in the reagent may be replaced by an equivalent amount of formic acid, but the appearance of the reaction requires a much longer time. The reaction in sterilized milk with either methylene blue-formaldehyde solution, or methylene blue-formic acid solution is probably due to the presence of thermostable bodies. The age of the milk has no influence upon the reaction, providing of course that the milk remains sterile. If small amounts of sodium hydroxid, ammonium salts, and phosphates are added the reaction is accelerated, particularly if a little milk sugar is added at the same time. Milk sugar when added alone is inert. Increasing the temperature somewhat will also aid the acceleration of the reaction.

Raw, pasteurized, and sterilized milk, and milk which has been boiled for a certain time were found to behave differently as regards the time required for the decoloration of the reagent. This is probably due to the demineralization of the milk, which begins at +50°, the destruction of the enzym, which starts in at 65 to 69°, and the decomposition of the proteins, which is influenced by heat.

Contrary to Sames and Römer's findings (E. S. R., 23, p. 709; 24, p. 412), the author never noted the absence of a positive reaction with milks which were retained in the udder longer than usual, or was there ever any absence of the reaction in the initial milk.

The Rothenfusser reaction was found to be very accurate, and to detect an addition of 1 part of raw milk to 1,000 parts of boiled milk. The Schardinger

method, however, which does not necessitate the preparation of a milk serum, can be given the preference for use in the milk bacteriological laboratory.

The catalase reaction for detecting milks coming from cows affected with mastitis, E. HUYNEN (*Ann. Méd. Vét., 60 (1911), No. 5, pp. 279–290, figs. 4*).—This reaction is of value for detecting the milk obtained from mastitic cows. A milk of which 5 cc. will yield 1.5 cc. of oxygen (from 2 cc. of 1 per cent hydrogen peroxid solution) is to be regarded with suspicion.

The volatile acidity of gum tragacanth compared with that of Indian gum, W. O. EMERY (*U. S. Dept. Agr., Bur. Chem. Circ. 94, pp. 5, fig. 1*).—As the amount of volatile acid developed by samples of gum tragacanth is nearly 7.5 times less than that contained in Indian gum (*Sterculia urens*), and that of both gums is relatively constant it is an easy matter to detect these gums, either alone or in a mixture. A method is described and results reported.

Determination of nicotin, G. BERTRAND and M. JAVILLIER (*Ann. Chim. Analyt., 16 (1911), No. 7, pp. 251–256; abs. in Chem. Ztg., 35 (1911), No. 72, p. 657*).—This is a study of the silicotungstic acid method devised by the authors, which was found to yield excellent results under varying conditions, particularly in the presence of ammonium salts. The determination of nicotin in the presence of pyridin may be made accurately by slightly modifying the procedure, as pyridin and its homologues are optically inactive and both pyridin and nicotin are precipitated by silicotungstic acid. The results compare well with those obtained by Schloesing's method, although slightly higher.

An electrically controlled constant-temperature water bath for the immersion refractometer, H. C. GORE (*Jour. Indus. and Engin. Chem., 3 (1911), No. 7, pp. 506, 507, figs. 2*).—Previously noted from another source (E. S. R., 25, p. 311).

Mixing, stirring, and kneading, and the machines used for these purposes, H. FISCHER (*Mischen, Rühren, Kneten und die dazu verwendeten Maschinen. Leipsic, 1911, pp. 90, figs. 122; rev. in Amer. Chem. Jour., 47 (1912), No. 4, pp. 352, 353*).—The book undertakes "to discuss the principles of the operations of mixing, stirring, and kneading as carried out in industrial chemical work, and to describe by diagrammatic sketches some of the leading forms of apparatus used, as far as this is necessary to show some applications of the principles."

International catalogue of scientific literature. D—Chemistry (*Internat. Cat. Sci. Lit., 8 (1908), pp. VIII+1067*).—This issue deals with the literature received between December, 1908, and November, 1909.

Yearly report in regard to the progress made in agricultural chemistry, edited by T. DIETRICH (*Jahresber. Agr. Chem., 3. ser., 12 (1909), pp. XXXIV+545; 13 (1910), pp. XXXII+619*).—These are the reports for the years 1909 and 1910, continuing previous work (E. S. R., 22, p. 311).

Report of the offcial agricultural chemical, physical, and analytical laboratories of Belgium, 1910 (*Raps. Sta. Chim. et Phys. Agr. et Labs. Anal. [Belgium], 1910, pp. 75*).—This is a report of the directors of the various state laboratories in regard to work in progress, and the results of examining feeding stuffs, fertilizers, foods, sugar beets, industrial products, and miscellaneous samples. In some instances the methods of analysis used in the investigations are included.

Modern chemical technology, edited by O. DAMMER (*Chemische Technologie der Neuzeit. Stuttgart, 1910–11, vols. 1, pp. XV+852, figs. 217; 2, pp. XIX+1065, figs. 508; 3, pp. XXIV+1049, figs. 402*).—This work, which has been written by 50 docents and practical men, embraces almost the entire field of chemical technology. The topics of interest to agriculture and agrotechny include paper, starch, dextrin, glucose, cane sugar, bread, wine, beer, alcohol, press yeast, utilization of waste yeast, vinegar, fats and oils, resins and balsams,

milk and dairy products, conserved fruits and vegetables, tannin, peat, water, and alkaloids.

These books are to be companion volumes to the author's handbook on chemical technology.

Yearly reports in regard to the fermentation organisms, A. Koch (*Jahresber. Gärungs-Organ., 18 (1907), pp. VIII+684; 19 (1908), pp. VIII+670*).—These are the reports for 1907 and 1908 of the progress made in the field of the fermentation organisms.

Manufacture of starch, F. Rehwald (*Die Stärkefabrikation. Vienna and Leipsic, 1911, 4. ed. rev., pp. VII+302, figs. 87*).—This is a technological handbook giving methods for the manufacture of starch, dextrin, glucose, sirup, and sugar color.

METEOROLOGY—WATER.

The climate of Switzerland, J. Maurer, R. Billwiller, Jr., and C. Hess (*Das Klima der Schweiz. Frauenfeld, Switzerland, 1909, vol. 1, pp. VIII+302, pls. 5, figs. 9; 1910, vol. 2, pp. V+217*).—The climatic features of Switzerland as shown by observations extending over 37 years (1864–1900) are described.

The influence of rain and of temperature of the air on cereal crops in the Governments of Saratov, Samara, and Tambov, S. Kharizomenov (*Selsk. Khoz. Vïestnik Iugo-Vostok, 1911, No. 4–6; abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 12 (1911), No. 6, pp. 927, 928; Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 3, pp. 609, 610*).—From a comparison of meteorological conditions and crop yields during 25 years, the following conclusions are drawn:

"Increase of rain in winter is accompanied by a parallel increase in the crops; abundant rainfall in November, December, January, February, and March is beneficial to all cereals, but heavy rains in April are on the contrary very injurious to them. Increased rainfall in August, September, October, and April causes a decrease in the crops of spring cereals, while winter cereals and perennial forage plants are not harmed. The explanation of the good and bad effect of rain must be sought for in pedology and in vegetable physiology. The effect of capillary action is the principal cause of the damage wrought by rain. A detailed description is given of the movement of water in the soil during the different seasons of the year.

"In the district of Saratov, as the temperature is below the optimum in autumn and winter, and above in June and July, it follows that during both these seasons the nitrification processes are retarded and hindered."

Precipitation in Havana in each month of the years 1859 to 1908, E. W. Müller (*Tropenpflanzer, 15 (1911), No. 12, pp. 678, 679*).—A table gives the monthly and yearly averages for this period. The annual mean for the 50 years is 1,234.8 mm. (48.6 in.) The driest month is March, with a 50-year average of 51.8 mm., the wettest June, with an average of 166 mm.

Protection of Beaujolais against hail by electric barrages, J. Perraud (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 33 (1912), No. 11, pp. 324–332*).—An account is given of the installation of the Beauchamp method (E. S. R., 22, p. 118) in this region.

Water powers of North Carolina (*N. C. Geol. and Econ. Survey Bul. 20, 1911, pp. 383, pls. 2, figs. 2*).—This bulletin has been prepared under the direction of M. O. Leighton and M. R. Hall of the U. S. Geological Survey. A large amount of data is presented relating to the flow and power of streams in North Carolina, including annual rainfall data, gage heights, and dis-

charge measurements. The topography of each stream basin and of the tributary drainage areas is described.

The data in general show that North Carolina has a large source of available water power both in the larger and the smaller streams. The "small power" streams may be found in all parts of the central and western portions of the State.

The origin and wholesomeness of the saline waters in the London Basin, J. C. THRESH (*Lancet [London], 1912, I, No. 5, pp. 311, 315, 316*).—This is a brief discussion of the results of examinations of waters derived from the chalk and Thanet sands under southeastern Essex, London, and other places, some of which contain as high as 70 grains per gallon of sodium chlorid and many average at least 50 grains per gallon. It is explained that these waters are derived from an admixture of sea water and chalk water altered by percolation through the Thanet sands. The sodium chlorid derived from the sea water remains unchanged while the calcium carbonate of the chalk water is converted into sodium carbonate. In spite of this unusual character, the waters are considered wholesome.

Purification tests of the water supply of Marseille, O. ARNAUD, C. FABRY, and MOITESSIER (*Off. Internat. Hyg. Pub. [Paris], Bul. Mens., 3 (1911), No. 12, pp. 2177–2215, figs. 8*).—Seven processes used in these tests are described and the results obtained with them are discussed. The processes included chemical precipitation, filtration, and purification by means of ozone and ultraviolet rays. The best results from an economic standpoint were obtained with a system of filtration with submerged sand filters, although good results were obtained by ozonization and treatment with ultraviolet rays.

Utilization of sludge in England, L. BATLEY (*Municipal Jour. and Engin., 32 (1912), No. 13, p. 483*).—It is stated that "the economical utilization of waste products generally has advanced further in England than in this country and the disposal of sewage sludge or pressed sewage cake has been receiving considerable attention there within the past few years. Various methods of disposal have been suggested with the object of so treating the sewage that the expense entailed may be, as far as possible, more than covered by the receipts obtained from the sale of the products. An additional inducement is the fact that the problem of disposal of sewage sludge is a very present one and is yearly becoming more urgent."

The methods employed by various towns in England are briefly described. At Bradford the sludge is rendered to remove the grease which is sold as "Yorkshire grease" for $40 per ton. The filter press cake remaining after the extraction of the grease and containing about 40 per cent of moisture is dried and sold as a fertilizer base for $2.50 per ton, finding "a large and increasing market at home, on the Continent, and in the United States." At Chorley the sludge is used with satisfactory results for the manufacture of gas.

At other works in this region the method generally followed is to press the sludge into cake, containing from 60 to 75 per cent of moisture, and to give it away to farmers in the immediate vicinity or use it to fill up low lying land. Although the material has from 3 to 4 times as much fertilizing value as ordinary farmyard manure, it is in such form that there is little demand for it from farmers, who in some cases are paid from 12 to 24 cts. per load to remove it.

At Manchester part of the sludge from the filter beds is dried and sold as a fertilizer for $5 per ton, the demand being much greater than the supply. At Kingston-on-Thames the sludge is mixed with various materials, including alum, blood, and clay, dried, and sold as a fertilizer by a private company under the name of "native guano" for from $15 to $20 per ton. At Norwich "a plant

is now being erected for pressing and drying the sludge and for recovering the grease which forms about 30 per cent of the dry product; the dry residue, which contains about 3 per cent nitrogen, to be sold as a fertilizer." At Tadcaster arrangements are being made to handle the sewage in much the same way as is done at Bradford, "and the product has already been sold in advance for several years to come, to be exported to the United States."

At Leeds the sludge is used for the manufacture of ammonia gas by destructive distillation, the ammonia being recovered in the form of ammonium sulphate which has a value of $70 per ton. The residue from the retorts is used for the manufacture of artificial stone or bricks.

At Oldham the grease is recovered from the sludge by distillation with steam. The dry residue from this process is sold for a small price as a fertilizer. It is thought to have little value for this purpose because a large part of the nitrogen is driven off in the distillation.

In Dublin a part of the sewage sludge "is mixed in large tanks with a small proportion of spent brewery yeast and fermentation is started by the aid of hot water pipes. The organic matter separates out and is dried and sold as fertilizer in powder form under the name of 'Fertilite,' $12 per ton being obtained, and it is understood that there is a large demand for it."

Sewage sludge disposal, I. Batley (*Municipal Engin., 42 (1912), No. 4, pp. 227–229*).—This article covers much the same ground as that noted above.

The private sewage disposal plant, J. Van V. Manning (*Sci. Amer., 106 (1912), No. 15, pp. 332, 342, 343, figs. 6*).—Simple systems adapted to the detached villa and farm or country house are described. The principal requirements of these disposal plants are "(1) preliminary treatment of sewage to liquefy solids and suspended impurities, and hold back grease, scum, and sludge; (2) purification of effluent by natural or artificial filtration; (3) an acre or more of land; and (4) slope sufficient for sewage to flow by gravity."

SOILS—FERTILIZERS.

Soils of the eastern United States and their use, XXIX–XXXV, J. A. Bonsteel (*U. S. Dept. Agr., Bur. Soils Circs. 54, pp. 8; 55, pp. 10; 56, pp. 8; 57, pp. 10; 58, pp. 11; 59, pp. 10; 60, pp. 13*).—These circulars discuss the following soil types with respect to geographical distribution, characteristics, surface features and drainage, use, improvement, and crop adaptations.

Circular 54 deals with the Crowley silt loam of which a total of 477,120 acres in 3 areas in central Arkansas and southwestern Louisiana has been surveyed and mapped by the Bureau of Soils.

Rice under irrigation constitutes the great dominant crop on this soil type, and it is stated that since 1885 the acreage has grown from practically nothing to hundreds of thousands of acres.

Circular 55 deals with the Chester loam of which a total of 600,680 acres in 8 areas in southeastern Pennsylvania, central Maryland, and north central Virginia has been surveyed and mapped.

The surface topography of the Chester loam is described as rolling to somewhat hilly and natural drainage is, therefore, well established. Some sections are considerably eroded and should be terraced and maintained in sod during a considerable portion of the crop rotation.

"The Chester loam is an excellent general-purpose farming soil; the principal crops grown are corn, wheat, oats, rye, potatoes, and hay."

Circular 56 deals with the Penn loam, of which a total of 320,266 acres in New Jersey, Pennsylvania, Maryland, and Virginia has been surveyed and

mapped. The soil is stated to be fairly well drained, but the more level portions of the type would be benefited by tile underdrainage.

Circular 57 discusses the Carrington silt loam of which a total of 739,584 acres in 7 areas in 5 States has been surveyed and mapped. This type is found upon the uplands of northern Indiana, southern Wisconsin and Minnesota, and in the eastern portion of both North and South Dakota. The drainage of the soil is adequate, as a rule, but in minor depressed areas tile drainage is considered necessary. The soil is well suited to the production of grains and grass, dairying and stock raising being the principal industry.

Circular 58 gives an account of the Carrington clay loam of which a total of 612,864 acres in 6 areas in 4 States has been surveyed and mapped. This type is found in southern Wisconsin, north and central Iowa, southern Minnesota, and eastern North Dakota. The drainage is good over the greater portion of the region, only small depressions requiring tile drains. "In the more southern and eastern areas corn, oats, and hay are the chief staple crops. Cabbages are raised as a special crop. Farther north spring wheat, barley, rye, and flax are grown, while in the most western areas of its occurrence durum wheat is coming to be an important and profitable crop."

Circular 59 discusses the Marion silt loam of which a total of 694,040 acres in 4 areas in Missouri and Illinois has been surveyed and mapped. This is a prairie soil adapted to small grain farming, winter wheat constituting the most important crop with oats and hay occupying considerable acreage. Drainage is stated to be imperfect in this type of soil which is also low in organic matter and needs lime.

Circular 60 deals with the Volusia loam of which a total of 554,082 acres in 7 areas in northern Pennsylvania, southern and central New York, and northeastern Ohio has been surveyed and mapped. It is described as a general farming and dairying soil with an altitude ranging from 600 to 1,500 ft., a rolling to hilly surface fairly well drained except in depressed and level areas, and adapted to the production of grass for hay and pasture. Oats constitute the chief crop and barley and winter wheat are grown to a limited extent. In the lower areas corn is grown for grain and at the high altitudes flint varieties may be grown for silage. Buckwheat is an important catch crop.

Soils of the Shenandoah River terrace: A revision of certain soils in the Albemarle area, Virginia, H. H. Bennett (*U. S. Dept. Agr., Bur. Soils Circ. 53, pp. 16, figs. 4*).—In revising some of the soils of the Albemarle area, Virginia, particularly the Edgemont stony loam, the author proposes to classify those soils of the lower, smoother division of the original Edgemont stony loam as the Waynesboro and the Holston series; and those of the mountainous belt of the region, as the Dekalb series. The principal soil types under each series are described.

Soils in the San Luis Valley, Colo., M. H. Lapham (*U. S. Dept. Agr., Bur. Soils Circ. 52, pp. 26, fig. 1*).—The results of a reconnoissance survey of the region, including its climatic conditions, soils, and agriculture, are reported.

The region occupies a valley in south central Colorado about 80 miles long with a maximum width of 45 miles. The valley is flat and treeless. The soils of the foot slopes and alluvial fans are of porous, sandy, and gravelly character underlain by leachy, gravelly subsoils. The alluvial soils of the stream bottoms are usually sandy loams, loams, or clay loams underlain by gravelly subsoils. The soils of the marginal slopes are gravelly sand, sandy loam, or loam, and are derived mainly from volcanic rocks. They are leachy and not retentive of moisture. The northern and central parts of the valley contain small areas of the gravelly foot slope soils. The central and eastern parts of the valley

contain large areas of wind-drifted sands, broken by low flats without drainage and occupied in places by alkali lakes. Although only a relatively small proportion of the valley is now under cultivation, most of the soils are easily cultivated and well adapted to grains, grasses, legumes, and certain vegetables. Some of the lower lying slopes and depressions suffer from seepage water and alkali.

The agricultural possibilities of the Canal Zone. Part I, Reconnoissance soil survey, H. H. BENNETT (*U. S. Dept. Agr. Rpt. 95, pp. 5–38, pls. 10, fig. 1, map 1*).—This report which is accompanied by a paper on The Outlook for Agriculture in the Canal Zone (see p. 91) discusses the region with respect to physical features and area, climatic and agricultural conditions, forests, soils, and irrigation.

The soil material ranges from the fine beach sand through alluvial and colluvial clay loams of stream bottoms and lower slopes to the more predominant plastic, heavy residual clays of the hills. The residual clay types cover about 80 per cent of the available agricultural land and are formed through the decomposition in place of volcanic, igneous, and sedimentary rocks. The range in organic matter content of the residual types in samples analyzed was from 1.75 to 8.30 per cent, with few below 3 per cent. The clay loams of the bottoms and lower slopes contain sufficient organic matter and coarse grains to give a good tilth. The sandy lands which occur exclusively as narrow coast fringes consist principally of the coarser and more resistant particles of rock fragments, of stream sediments, and shore-line degradation products.

Characteristic of the soils are the small surface accumulation of vegetable mold and the strong resistance offered to erosion. The "rapid disappearance of plant remains is due in a large measure to the fact that the high humidity of the rainy seasons, followed by the winds of the warm dry season, favors rapid disintegration and oxidation of plant remains." The resistance to erosion is due to the universally low content of sand and high content of clay, coupled with the fact that the soils are never loosened by freezing. The lands are further assisted in holding place against wash by the dense vegetation and the almost total absence of cultivation.

Records of drainage in India, J. W. LEATHER (*Mem. Dept. Agr. India, Chem. Ser., 2 (1912), No. 2, pp. VIII+63–140, figs. 11; abs. in Chem. Abs., 6 (1912), No. 11, p. 1487*).—Studies of evaporation and of the amount, nitrate content, and movement of drainage water from fallow and from cropped soils at Cawnpore, 1903–1910, and at Pusa, 1906–1910, are reported. See also a previous note (E. S. R., 23, p. 420).

The evaporation was nearly independent of the season, whereas the drainage varied with the rainfall. A good crop reduced evaporation to two-thirds or one-half of that from fallow land. The amount of ammonia from both bare fallow and cropped land was as small as has been found at Rothamsted. The amount of nitrate in years of good rainfall was much greater than at Rothamsted. "The amount of nitrate in drainage water from cropped land is very much less than from fallow land, and there is some evidence that higher plants interfere with nitrification. Nitrification has been found at Pusa to be active only during wet weather and then only for a short time. The evidence of the Indian records goes to show that the water descending during wet weather passes very uniformly through the soil and not chiefly by means of 'larger channels' as has been commonly supposed."

Lysimeter investigations, 1911, E. KRÜGER (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 4 (1912), No. 2, pp. 129–133*).—This is a continuation of previous work (E. S. R., 25, p. 21), and reports studies on the influence of

ground-water levels maintained at heights of 15.76, 31.52, and 47.28 in., and of soil aeration on the yield of oats. It is stated that the season was very dry.

The high water levels increased the yield of straw substantially as compared with the lower levels. A ground-water level of 31.52 in. below the surface was most advantageous and the amount of water required by this method for the production of a pound of dry matter was 618 lbs. as compared with 550 lbs. by sprinkling. Aerating the soil decreased the yield of crops in most cases, which was thought to be due to the sandy soils used and to the dry season.

The flow of subsoil water, H. E. HURST (*Cairo Sci. Jour., 6 (1912), No. 65, pp. 27–32*).—In this paper an attempt is made to give part of the theory of the flow of a liquid through a porous medium, and to obtain the general equation of flow as simply as possible without applying the theory to the solution of any problems. The phenomena dealt with are those occurring in the saturated portions of the soil.

Conservation of the soil, A. GRÉGOIRE (*Rev. Écon. Internat., 8 (1911), IV, No. 2, pp. 368–383; 9 (1912), I, No. 2, pp. 391–408; II, No. 2, pp. 417–432*).—This is a discussion by the director of the agricultural experiment station of Gembloux, Belgium, of the chemical, physical, and economic factors of soil conservation.

The adsorption phenomena of cultivated soils, J. H. ABERSON (*Meded. Rijks Hoogere Land, Tuin en Boschbouwsch. [Wageningen], 5 (1911), No. 1, pp. 1–43, figs. 4; Ztschr. Chem. u. Indus. Kolloide, 10 (1912), No. 1, pp. 13–22; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 5, p. 243*).—From the results of experiments with clay soils treated with varying amounts and concentrations of solutions of ammonium chlorid alone and with additions of calcium, potassium, and sodium chlorids and sodium nitrate, the author concludes that during the process of adsorption an equilibrium was established in the exchange of ions of the soil and of the added solution. It is held that this exchange of ions was not the result of a purely chemical reaction in the sense maintained by Guldberg and Waage. The addition of ions which reacted with those in the solution reduced the adsorption. Soil adsorption followed the same law as adsorption by charcoal, wool, silk, etc. Adsorption in the soil is held to be a function of the surface of the colloidal substances.

It would seem probable that the aluminum silicates in the soil are the compounds which take up the calcium, magnesium, potassium, and sodium ions, thus forming the adsorption compounds. There was a certain relation, although no exact proportionality, between adsorption and hygroscopicity (as determined by the Mitscherlich method) of the soil. Increasing the temperature lowered the adsorption of the soil just as in the case of other colloidal substances.

The biological absorption of soils, J. STOKLASA (*Chem. Ztg., 35 (1911), No. 154, pp. 1425–1427; abs. in Chem. Zentbl., 1912, I, No. 12, p. 939*).—Studies of the absorption of phosphate, potassium, ammonium, and nitrate ions from solutions of ammonium and potassium sulphates, ammonium and potassium chlorids, monocalcium phosphate, and potassium and calcium nitrates by sterilized and unsterilized soils, and soils inoculated with a culture of *Bacillus mycoides*, are reported. The process of absorption continued from 23 to 30 days, the solutions being allowed to percolate through the soil during this time.

The absorption of the phosphoric acid was from 3.8 to 14.5 per cent greater for the unsterilized than for the sterilized soils. This difference is attributed to the bacterial activity and is called the biological absorption. The biological absorption of all the ions was substantially smaller for acid or unsaturated and less fertile soils than for the alkaline or saturated and fertile soils. The

biological absorption increased with the alkaline character, porosity, presence of easily decomposed carbon compounds, and sufficient nitrogen in assimilable form. The absorption of ammonium and nitrate ions was dependent upon the presence of the phosphate and potassium ions. The absorption of the ammonium ion was from 3.42 to 8.01 per cent greater than that of the nitrate ion.

The general conclusion drawn is that in soil investigations, particularly as regards the question of productivity, account must be taken of the biological absorption as well as the physical and chemical absorption. It was found, for example, that rye plants made a much stronger growth in inoculated than in uninoculated, sterilized soils, thus indicating that the bacterial activity influenced the plant food of the soil and rendered it more readily assimilable by the plants. The productive soils showed a high biological absorption not only for the ammonium ion but for the phosphate and potassium ions as well.

Biochemical relations of the phosphate ion in the soil, J. STOKLASA (*Biochemischer Kreislauf des Phosphat-Ions im Boden. Jena, 1911, pp. 159, pls. 12*).—This is a reprint in book form of matter which has in large part already been noted from another source (E. S. R., 25, p. 624).

The loss of ammonia from soils and experiments on the nitrogen balance in pot experiments, P. EHRENBERG (*Fühling's Landw. Ztg., 61 (1912), No. 2, pp. 41–53*).—This is a review of the work of O. Lemmermann (E. S. R., 26, p. 320), whose conclusions agree with those of the author as to the small losses of ammonia from the use of ammonium sulphate, and of A. Koch (E. S. R., 26, p. 319), who reports large losses of ammonia from the use of ammonium sulphate under certain conditions. The author maintains that Koch used much larger amounts of ammonium sulphate and of lime than are ordinarily applied in practice and that, therefore, his results have little or no practical significance.

The author also refers to the work of Kraus (E. S. R., 26, p. 516) as indicating that the wind may be an important factor in influencing the rate of evaporation of ammonia from the soil.

The loss of ammonia from manured soils, P. EHRENBERG (*Fühling's Landw. Ztg., 60 (1911), Nos. 13, pp. 441–452; 14, pp. 479–500*).—This is a critical review of the work of P. Liechti and E. Ritter (E. S. R., 25, p. 22), in which it is maintained that the amount of manure used by these investigators in their experiments was in excess of that which is ordinarily applied in rational systems of cropping and that, therefore, the results of the work as bearing on the loss of ammonia have no practical value.

The loss of ammonia from soils, P. LIECHTI and E. RITTER (*Fühling's Landw. Ztg., 61 (1912), No. 3, pp. 83–109*).—This is a reply to the above, pointing out in a general way the fallacy of applying the results of experiments with manure to those obtained with ammonium sulphate. It is held that manure contains its ammonia in the form of carbonate, which is much more susceptible to loss of ammonia than ammonium sulphate, and that there is danger of considerable loss of ammonia when manure is applied as is ordinarily done in practice.

Green manuring in Mysore, L. C. COLEMAN, B. N. IYENGAR, and N. SAMPATIENGAR (*Dept. Agr. Mysore, Gen. Ser. Bul. 1, 1912, pp. IV+22, pls. 8, figs. 3*).—This bulletin gives the results of a 2-year study of green manuring as practiced in Mysore, particularly on paddy soils. It is shown that sunn hemp, cowpeas, different varieties of gram, and avare are used to a considerable extent as green manuring, but that the practice is very variable and not so extensive as it should be. Suggestions regarding the improvement of methods are made.

The smells of manure works of Paris, O. BOUDOUARD (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 4, pp. 238–240; abs. in Jour. Soc. Chem. Indus., 31*

(*1912*), *No. 4, p. 196*).—An investigation of the conditions affecting the odors of manure works showed that stocks of mineral phosphates gave off little or no odor, but that dissolved bone and phosphatic guano evolved evil-smelling odors which were increased by elevation of temperature, stirring, and variations in pressure and electrical conditions of the air. Odors from dry fertilizers lessen with time, but from moist fertilizers intensify as they gradually dry.

Fertilizer resources of the United States, F. K. Cameron, R. B. Moore, et al. (*U. S. Senate, 62. Cong., 2. Sess., Doc. 190, 1912, pp. 290, pls. 19, figs. 3, maps 19*).—This document, transmitted to the Senate by the President of the United States, is "a preliminary report on the fertilizer resources of the United States, describing investigations which have been carried out by experts of the Bureau of Soils, following a special authorization by the last regular session of Congress," with appendixes containing technical reports on the natural phosphates of Tennessee, Kentucky, and Arkansas, with a list of references to the bibliography of phosphates; memoranda on the manufacture of acid phosphate in the Southern States and on the manufacture of sulphuric acid and ammonium sulphate in this country; data regarding alkali crusts containing 0.5 per cent or more of potash; a list of patents for the extraction of potash salts; memoranda regarding saline claims, potash deposits, etc., and jurisdiction over kelp groves; and papers dealing with the botany, chemistry, industrial uses, and food value of the kelps of the coast of the United States and Alaska, with a bibliography of the literature of marine algæ and their uses. The report explains the purpose and scope of the work undertaken by the Bureau of Soils and summarizes the more important results of this work to date.

It is stated that $120,000,000 worth of fertilizers are now annually used in this country, but that "a much increased production and wider use of commercial fertilizers must accompany or closely follow the economic changes and readjustments now taking place in the United States."

It is believed that the United States has within its borders supplies of raw materials for fertilizers which "will be ample for a long but indefinite period. . . . This country is fortunate in having within its confines enormous deposits of natural phosphates, including the well-known fields of South Carolina, Florida, Tennessee, Arkansas, and Kentucky, lesser deposits in many other States, and the greatest deposit of the world in Montana, Wyoming, Utah, and Idaho."

Deposits of nitrates "have been found in this country, but none of commercial importance have yet been exploited. Ammonium salts, a product of the coke ovens and gas furnaces, slaughterhouse products, cotton-seed meal, and in lesser quantities, other nitrogenous organic materials, are utilized in the manufacture of fertilizers. The so-called atmospheric products, calcium cyanamid and basic calcium nitrate, are finding an increased use." The search for nitrate deposits in the United States is being actively prosecuted and other sources of nitrogen, especially ammonium sulphate from by-products of coke ovens, are being developed.

"Up to the present there have been no sources of potash in this country commercially developed." The search for mineral deposits of potash, which has been actively carried on, has given results which seem to warrant the continuation of such investigations (see abstract below), but the report holds that the most promising source of potash yet discovered in the United States is the kelp groves along the Pacific coast. These kelps "are essentially different in certain respects from the Atlantic kelps and apparently from those of Japan. They yield a much higher percentage of potash (five or six times as much as the Atlantic kelps), but have a much lower percentage of iodin."

Is is estimated that "the Pacific kelps can easily be made to yield upward of 1,000,000 tons of potassium chlorid annually, worth at least $35,000,000, and that the cost of production can largely, if not entirely, be covered by the value of the iodin and other minor products. The value of the present annual importations of potash salts from Germany is, in round numbers, $12,500,000."

Potash salts: Summary for 1911, W. C. PHALEN (*U. S. Geol. Survey, Advance Chapter from Mineral Resources of the United States, Calendar Year 1911, pp. 31*).—This is an advance chapter from Mineral Resources of the United States, 1911, and reports the progress in work by the U. S. Geological Survey, the Bureau of Soils of this Department, and private persons in the search for a domestic supply of potash, which has included investigations of "(1) saline residues, (2) natural and artificial bitterns, (3) alunite and similar minerals, (4) the igneous rocks containing as a lower safe limit at least 6 per cent of potash (K_2O), (5) the greensand marls of Kentucky, New Jersey, Tennessee, and probably other States, (6) organic sources, including wood ashes, beet-sugar molasses and residues, wool scourings, and seaweed."

The work of the Geological Survey in 1911 included "(1) deep drilling for saline residues, (2) the collection and examination of natural and artificial brines and bitterns, (3) the examinations of deposits of alunite and other minerals containing potassium, (4) the examination of certain occurrences of igneous rocks known to contain large quantities of potash." At the time this report was made the deep drilling operations had not revealed potash deposits of commercial importance; one Ohio bittern had shown a considerable percentage of potash (3.9 per cent); a considerable deposit of rather pure alunite (hydrous potassium and aluminum sulphate) had been discovered near Marysvale, Utah (E. S. R., 26, p. 526); and the extensive leucite deposits of Sweetwater County, Wyo. (E. S. R., 26, p. 623), had been examined and their potash capacity estimated at 197,349,617 short tons of potash. The examinations of samples of other igneous rocks, particularly those rich in potash feldspar and of the potash-yielding capacity of New Jersey, Kentucky, and Tennessee marls had revealed little new information of special commercial importance. Accounts are given of the fruitless search for potash salines in the Otero Basin, New Mexico (see below), of methods of recovering potash from alunite and other igneous rocks and marls, and of simple field and laboratory tests for potash.

Data are given regarding the consumption of potash salts in the United States, amounting to 672,639,581 lbs. valued at $11,826,106 in 1911, and the production of potash from wood ashes in the United States (1,866,570 lbs. valued at $88,940 in 1910), and reference is made to the industries in which potash salts are used.

The work of the Bureau of Soils of this Department on kelp as a source of potash (see abstract above) is summarized, attention being called to the recent establishment at Cardiff, on the coast of southern California, of a plant for the manufacture of potash from kelp.

An investigation of the Otero Basin, New Mexico, for potash salts, E. E. FREE (*U. S. Dept. Agr., Bur. Soils Circ. 61, pp. 7*).—An investigation which led to entirely negative results is briefly reported in this circular.

Potash from the Pacific kelps (*Jour. Indus. and Engin. Chem., 4 (1912), No. 2, pp. 76, 77*).—This is a brief discussion based upon the work of the Bureau of Soils of this Department on the possibilities of potash production from Pacific coast kelps.

Leucite as a potash fertilizer, Z. BONOMI (*R. Lab. Chim. Agr. Udine, Ric. Sper. e Attiv. Spiegata, 3 (1909–10), pp. 17–25*).—Comparative tests of leucite

and potassium sulphate as fertilizers for medic and *Lotus corniculatus* are reported. The leucite showed considerable fertilizing value, but much less than potassium sulphate.

On the economic use of potassic fertilizers, Z. BONOMI (*R. Lab. Chim. Agr. Udine, Ric. Sper. e Attiv. Spicgata, 3 (1909–10), pp. 39–53*).—This is a fourth paper on this subject (E. S. R., 20, p. 925), and reports tests of potassic fertilizers on clover and medic, the general conclusion being that the use of potassium sulphate on these crops was economical.

Comparative tests of calcium and sodium nitrates as fertilizers, Z. BONOMI (*R. Lab. Chim. Agr. Udine, Ric. Sper. e Attiv. Spicgata, 3 (1909–10), pp. 27–32*).—The results of the series of experiments reported in this article were variable, sometimes favoring one nitrate and sometimes the other, but indicating on the whole about an equal efficiency for the two.

Chilean production of nitrate, A. A. WINSLOW (*Daily Cons. and Trade Rpts. [U. S.], 14 (1911), No. 203, p. 959; 15 (1912), No. 79, p. 39*).—It is stated that the production of nitrate in Chile in 1911 was the highest ever recorded. It amounted to 54,297,531 Spanish quintals (of 101.4 lbs. each) during the nitrate year ended June 30, 1911, and 54,784,271 quintals during the calendar year 1911. The production during the calendar year 1910 amounted to 53,596,000 quintals. The business was prosperous notwithstanding the low prices which prevailed during the first 6 months of the year, and which fell as low as $1.66 per quintal on board steamer on the coast in March. The price, however, gradually advanced to $1.94 per quintal in October.

New works, which it is estimated will increase the output 18,000,000 quintals per annum, were in progress during the year, and the Chilean congress authorized the further sale of nitrate lands.

"The consumption of nitrate during 1911 increased 108,000 tons. The United Kingdom consumed 10 per cent more than in 1910, the United States 10 per cent, Holland 7 per cent, Belgium 7 per cent, France 4 per cent, and Italy 12 per cent, while Germany consumed about 4 per cent less."

Lime for Alabama soils, J. F. DUGGAR and M. J. FUNCHESS (*Alabama Col. Sta. Bul. 161, pp. 301–324*).—This bulletin discusses the forms, sources, and methods of application of lime, its action on different kinds of soils and crops, and its need in Alabama soils, and summarizes the results of experiments with lime in different parts of the State. It is stated that there are abundant sources of supply of lime in Alabama; also that there are large areas of acid soils in Alabama, although the exact extent of such soils has not been determined, and that "on most acid soils, as well as on some other soils, the use of lime generally increases the yield of most crops. . . .

"In the lime tests made in various parts of Alabama the average increases in yield attributable to the use of lime were as follows: Cotton 23 per cent, corn 11, cowpeas (seed and hay) 14, peanuts 24, velvet bean hay 35, soy beans (seed and hay) 49, German millet hay 11, sorghum hay 47, chufas 0, and sweet potatoes (loss) 17 per cent."

The litmus paper test for determining whether a soil is acid is described.

Liming the soil, J. B. ABBOTT (*Indiana Sta. Circ. 33, pp. 16, figs. 4*).—This is a popular discussion of this subject adapted to Indiana conditions.

The uses of peat for fuel and other purposes, C. A. DAVIS (*U. S. Dept. Int., Bur. Mines Bul. 16, 1911, pp. 214, pl. 1, fig. 1*).—This bulletin gives the results of an investigation primarily into the possibility of the economic use of peat as a fuel in the United States. Incidentally attention was also given to other uses of peat, namely, for the production of ammonium compounds and other chemical products and for fertilizers and other agricultural purposes.

It is stated that "peat land may be cultivated with profit if the right crops are chosen and the peat is sufficiently drained, decomposed, and fertilized. Many of the peat swamps in the northern part of the country are, however, of a type that will scarcely repay cultivation, since the peat is very poorly decomposed and would be a long time in reaching a state in which it could be safely used for most crops.

"On the other hand, even poorly decomposed peat may be very profitably used in many ways on farms to increase the fertility of the land, and to add to its productiveness indirectly, by conserving and preserving other more salable articles, or by saving valuable waste matter which could not be kept except by its use."

AGRICULTURAL BOTANY.

British fungi and lichens, G. Massee (*London, [1911], pp. X+551, pls. 42, figs. 19*).—This book contains chapters on the classification of fungi, how to study them, their collection and preservation, ecology, edible and poisonous fungi, diseases caused by fungi, etc. In part 2, which constitutes the greater portion of the work, the systematic arrangement of fungi is treated at length, many of the species being illustrated by colored plates. A rather brief chapter on lichens concludes the text. The primary object of the work is said to be to enable the reader to determine the names of the indigenous mushrooms, toadstools, etc.

Enzym studies of lower fungi, A. W. Dox (*Plant World, 15 (1912), No. 2, pp. 40–43*).—During the progress of a study of fungi, including the more common saprophytic molds, the author has demonstrated the presence of 14 enzyms and he shows their ability to hydrolyze various substances and the products of the hydrolysis. From the data obtained in the study of fungus enzyms, he believes that there is much to argue against the present conceptions of the specificity of enzyms.

Oxidizing enzyms in certain fungi pathogenic for plants, H. S. Reed and H. S. Stahl (*Abs. in Science, n. ser., 35 (1912), No. 897, p. 396*).—The authors call attention to the difference in the oxidizing ability of plant extracts as altered by parasitic fungi. The extracts of apples invaded by *Sphæropsis malorum* are said to show no oxidizing powers, while those attacked by *Glomerella rufomaculans* show a somewhat increased oxidizing ability. When grown in pure cultures on synthetic media Glomerella was found to develop oxidizing enzyms in certain media but not in others.

The root nodules of Myrica gale, W. B. Bottomley (*Ann. Bot. [London], 26 (1912), No. 101, pp. 111–117, pls. 2*).—The author reports a study of the origin and structure of the root nodules occurring on *M. gale*, only 4 groups of nonleguminous plants, alders, Elæagnus, Podocarpus, and cycads, having previously been recognized as possessing root nodules which are concerned with the assimilation of atmospheric nitrogen.

The peculiar nodule formations on the roots of *M. gale* have been frequently described, and the author has determined that from their structure they are outgrowths of lateral rootlets. They are caused by the presence of bacteria which are evidently similar to *Pseudomonas radicicola*, and experiments in flasks inoculated with cultures showed an increase of 2.05 mg. of nitrogen per 100 cc. of culture. Experiments with Myrica plants grown in sterilized soil showed that they did not flourish unless they possessed root tubercles. Plants devoid of tubercles, after inoculation with a culture, developed root nodules and grew well.

The morphology of the root tubercles of Alnus and Elæagnus, and the polymorphism of the organism causing their formation, Ethel R. Spratt

(*Ann. Bot.* [*London*], *26* (*1912*), *No. 101, pp. 119–128, pls. 2*).—A study of the root tubercles of Alnus and Elæagnus proves that they are modified lateral roots and are produced by infection of the root with a race of the nitrogen-fixing organism *Pseudomonas radicicola*. This bacillus enters the root and propagates itself in the cortex of the nodule as a rod-shaped organism. *P. radicicola* is believed to be a polymorphic organism exhibiting the bacillus and coccus forms. In Elæagnus the bacteria are found mainly in the region immediately behind the growing point, while in Alnus the bacteroidal tissue traverses the entire length of the nodule. The coccus form is believed to be correlated with a scarcity of available carbohydrates and a change of environment, and it is more resistant to the influence of external agencies than the rod-shaped form. The organism was proved to be capable of fixing free atmospheric nitrogen when isolated from the tubercles.

Nitrogen nutrition of Aspergillus niger, W. Brenner (*Ber. Deut. Bot. Gesell., 29* (*1911*), *No. 8, pp. 479–483; abs. in Jour. Chem. Soc.* [*London*], *101* (*1912*), *No. 591, II, p. 77*).—Experiments with *A. niger* in which a large number of forms of nitrogen were used are reported, and it is shown that ammonium lactate, tartrate, succinate, and oxalate, and asparagin were the most suitable compounds, followed by carbamid and the mineral salts of ammonia. In the case of pyridin nitrate, only the nitric nitrogen seemed to be assimilated. Free ammonia, sodium nitrite, ammonium valerate, and potassium cyanid were toxic.

The rôle of nitrogen in plant metabolism, J. M. Petrie (*Proc. Linn. Soc. N. S. Wales, 36* (*1911*), *pt. 1, pp. 97–140, dgm. 1*).—In continuation of previous studies (E. S. R., 22, p. 437), a further account is given of the rôle of nitrogen in plant metabolism. Studies are reported on the distribution of nitrogen in the seeds of *Acacia pycnantha*, the nitrogen in ripening seeds of *Vicia* spp., and the occurrence of potassium nitrate in plants. This latter substance, though one of the principal forms in which plants receive their nitrogen from the soil, was found by the author stored as a reserve in considerable quantity in a shrub, *Solandra grandiflora*.

The author believes that in green plants nitrates contribute to the formation of protein, without light, provided that carbohydrates be supplied, and that this change always begins by a reduction of the nitrates through nitrites to ammonia. Instead of the sudden transformation of the nitrate, he thinks it more probable that the enzymic reduction of nitrate to ammonia is the natural one. It is believed that the stages are the formation of ammonia, the production of hydrocyanic acid from formaldehyde through formic acid, ammonium formate, and formamid, and in the same way the passage of aldehydes in general through their acid amids to nitriles. From the interaction of ammonia, hydrocyanic acid or nitriles, and the various aldehydes, can be produced the amino-acids, and hence the synthesis of proteids.

Can humus be directly assimilated by the higher plants? M. Molliard (*Compt. Rend. Acad. Sci.* [*Paris*], *154* (*1912*), *No. 5, pp. 291–294*).—Experiments are reported with radishes grown in tubes containing sterilized and unsterilized soil to which was added ordinary soil humus. The analyses of the dry matter obtained showed in some instances an increase and in others a decrease of carbon, which must have come from the humus in the culture. The difference, however, was so slight that the author concludes that if humic material is directly assimilable by green plants it is in a very insignificant amount.

The influence of phytin on seedlings, A. R. Rose (*Abs. in Science, n. ser., 35* (*1912*), *No. 897, p. 393*).—Phytin, which is found almost universally in seeds and is considered to play a significant rôle in their germination, has been investigated to determine if possible what the influence of the phosphorus com-

pound may be upon the earliest growth of the plants. Lupine seedlings were germinated and afterwards allowed to grow in nutrient solutions, some of which contained a phytin compound.

The results seemed to indicate that the several phytates behave in the same manner as the corresponding orthophosphates. There was no suggestion of any specific influence of the phytic anion upon the seedlings. The phytin solutions in which the seedlings had been grown showed no increase in inorganic phosphorus or inosit, and there was, therefore, no evidence that the phytase of the seed acted upon the phytin in the surrounding liquid.

The action of sulphur on plants, E. BOULLANGER (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 6, pp. 369, 370*).—In the course of some experiments on catalytic fertilizers, a series was carried on with carrots, beans, celery, lettuce, chicory, potatoes, onions, etc., in which 70 gm. of sulphur was added to 30 kg of soil. The influence of the sulphur was apparent in every case and in some very conspicuous, exerting a favorable action on the growth of the plants and notably increasing the yield. Another series of experiments with sulphur used in connection with sterilized and nonsterilized soil showed that the action of the sulphur was quite pronounced with ordinary soil but had a very feeble effect with the soil that had been sterilized.

From this it is believed that sulphur does not act directly upon the bacterial flora of the soil nor assist materially in the development of certain organisms. Its exact action is to be investigated further.

The effect of ether and carbon bisulphid on plants, A. KOCH (*Centbl. Bakt. [etc.], 2. Abt., 31 (1911), No. 5–10, pp. 175–185; abs. in Jour. Chem. Soc. [London], 100 (1911), No. 590, II, p. 1124*).—Experiments are reported on the growth of buckwheat and mustard in soils that had been treated with ether and carbon bisulphid in varying quantities. Two crops were grown in each pot, one immediately following the application of the ether and the other seeded after the first crop had been removed.

A greater total yield as well as a higher amount of combined nitrogen was always found in the plants immediately following the application of the ether. The second crop, whether it was mustard or buckwheat, was less in yield and combined nitrogen than the first, and in some cases less than the check pots.

The investigations seem to show that the activity of the ether and carbon bisulphid is exerted in stimulating the development of the plant and that the increased yields were due to this fact and not to the influence of the substances on the nitrifying and denitrifying organisms.

Experiments with yeasts showed that fermentation was favored by a small amount of ether. Carbon bisulphid gave negative results, while it appeared to delay acid formation in the fermenting mash.

The effect of guanidin on plants under different conditions, O. SCHREINER and J. J. SKINNER (*Abs. in Science, n. ser., 35 (1912), No. 897, p. 391*).—The effect of 50 parts per million of guanidin, which has been generally considered harmful to plants, was tested on wheat seedlings in solution cultures and in soils.

Its toxicity did not show until the fifth or sixth day, when spots appeared on the leaves, but soon the plant was completely affected, falling over by the end of the second week. The effect of nitrates in the cultures was especially striking in that the harmful effect first showed itself in the cultures highest in nitrates and spread gradually to those lower in nitrates, frequently not appearing at all in those cultures which contained phosphate and potash but no nitrate. This seems to be an instance of a harmful nitrogenous constituent, accentuated by nitrates.

The influence of chemicals on the germinating capacity of dodders, G. D'Ippolito (*Staz. Sper. Agr. Ital., 44 (1911), No. 3-4, pp. 301–308; abs. in Riv. Patol. Veg., 5 (1911), No. 6, p. 86; Chem. Zentbl., 1911, II, No. 6, p. 379; Jour. Chem. Soc. [London], 102 (1912), No. 591, II, p. 82*).—Experiments are reported on the use of chemicals for destroying *Cuscuta arvensis* and *C. trifolia*.

Ammonium nitrate, sodium carbonate, calcium cyanamid, and formalin were found to kill dodder seeds, while potassium nitrate and carbonate did not entirely inhibit their germinating capacity. Sodium and calcium nitrates were less efficient, and magnesium sulphate is said to have had hardly any action.

The author recommends, for destroying dodder seeds in the soil, treatment with either a 2 per cent solution of ammonium nitrate or a 1 per cent solution of formalin.

The sterilization of seed in relation to the micro-organisms contained by them, G. Rossi (*Rend. Soc. Chim. Ital., 2. ser., 2 (1910), pp. 276–280*).—The difficulty of completely sterilizing seed without destroying their germinative ability is well known. The author gives the results of experiments to secure the sterilization of a number of kinds of seed. Lots of 25 seeds of each kind were placed for 3 hours in a 3 per cent solution of hydrogen peroxid, after which single seeds were transferred to tubes and placed in an incubator, where they were kept for 25 days.

No species of seed remained completely sterile, molds and bacteria making their appearance in different lots in from 5 to 15 days. Fifteen tubes containing seed of maize, 10 of dried peas, 23 of fresh peas, and 8 of lentils became infected. Only 1 each of chick-peas and Dolichos and 2 of wheat were contaminated at the end of the experiment.

Influence of continued electric currents on the growth of plants, F. Kövessi (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 5, pp. 289–291*).—The author reports experiments with wheat, supplemented by observations on rye, oats, barley, vetch, beans, various grasses, and a number of species of trees, as well as mosses, algæ, and various fungi.

The results obtained confirmed the conclusions of previous investigators that a continued electric current exerts a retarding effect on growth and is decidedly injurious to the germination of seed and the development of plants. The factors which determine the effect of electricity on plants are summarized, and it is shown that the intensity and potential of the current, the conductivity of the medium, and the various physical and biological factors which influence the life of the plant, as well as the chemical changes which take place, all exert an important rôle in plant growth as influenced by electricity.

The liberation of heat in respiration, G. J. Peirce (*Bot. Gaz., 53 (1912), No. 2, pp. 89–112, dgms. 8*).—In a previous note (E. S. R., 20, p. 734), the author gives a description of the value of Dewar flasks as respiration calorimeters for class use. Subsequent studies have confirmed their usefulness in physiological experiments. In the present paper an account is given of their use in germination studies with peas, and also of a study on the heat liberated by a mouse placed in a flask.

In the series of experiments with peas, seeds of different ages were germinated in the flasks. It was found that the amount of heat liberated by germinating peas decreased with their age, and apparently that the amount of heat liberated during germination may be used as an index of the age or freshness of seed.

Discussing the significance of heat liberation in respiration, the author calls attention to the fact that there is a much greater release of energy in the form of heat than can possibly be used by the organism, and states that it is evident

that if liberation of heat is the essential result of respiration, respiration must be an excessively wasteful process. He does not believe that respiration is primarily carried on for the purpose of furnishing the living organism with energy in the form of heat, as is often taught. He states that "the liberation of heat may be used, like carbon dioxid, by the physiologist as a gauge of the activity of respiration, but like carbon dioxid, it must be regarded by him as an end product, a waste, and not the essential product. The essential product of respiration may be energy, but if so, it is that energy which is immediately convertible, and is converted into work by the organism. On the other hand, respiration may be essentially a process of purification, in which useless or injurious substances are converted into forms which can be eliminated."

In conclusion he says: "In this study of heat liberation, therefore, I believe I have been occupied with an unessential, although inevitable, feature of the process of respiration. The essential part of the process of respiration is much more likely to be found to be chemical and not physical."

Incipient drying in plants, B. E. LIVINGSTON (*Abs. in Science, n. ser., 35 (1912), No. 897, pp. 394, 395*).—Attention is called to the fact that when water loss from the exposed membranes of leaves occurs at a higher rate than that at which water of imbibition enters these membranes the surfaces begin to dry. This phenomenon, which the author terms incipient drying, is said to occur in leaves which are subjected to relatively high transpiration. The drying acts as an automatic check upon transpiration.

The water balance of desert plants, D. T. MACDOUGAL (*Ann. Bot. [London], 26 (1912), No. 101, pp. 71–93, pls. 5*).—In continuation of previous accounts (E. S. R., 26, p. 530), the author describes experiments with Echinocactus, Carnegiea, Opuntia, Ibervillea, Dioscorea, Brodiæa, and other plants and discusses the physiological value of the water balances of the plants studied.

He states that the actual physiological value of water balances varies widely, as shown by his experiments with the different plants. All showed a high rate of water loss immediately upon removal from the soil, after which the curve of transpiration fell. In some instances the plants remained alive for a number of years.

The relation of soil acidity to plant societies, A. W. SAMPSON (*Abs. in Science, n. ser., 35 (1912), No. 898, p. 436*).—This is an abstract of a paper presented before the Botanical Society of Washington in February, 1912, which reports a study on the relation of soil acidity to plant cover based on range vegetation observations made in the Wallowa Mountains of northeastern Oregon.

It is stated that "the Leguminosæ are commonly extremely sensitive to acid soils, while many ericaceous species are rather closely confined to acid soils. For example, *Trifolium repens* fails in soils requiring for neutralization the relatively small amount, locally, of 5,000 lbs. of lime per acre-foot, while no species of Vaccinium is known that can be grown successfully in neutral or alkaline soils. Again, some genera (e. g., Populus and Rosa) are apparently indifferent as regards soil preferences. The preeminent forage plant of the Wallowa Mountains, *Festuca viridula*, varies very widely in adaptability to acidity. The soils on which it grows luxuriantly vary in lime requirements from 5,000 to 41,000 lbs. per acre-foot. The 4 species of Poa and the 2 species of Agropyron occurring locally reach their best development on calcareous and neutral soils."

The weeds of arable land in relation to the soils on which they grow, II, WINIFRED E. BRENCHLEY (*Ann. Bot. [London], 26 (1912), No. 101, pp. 95–109*).—A study of 106 species of weeds to determine whether definite associations exist

between species of weeds and the soils on which they grow is reported (E. S. R., 25, p. 28).

In each district investigated there appears to be a definite association, which may be either local or general. If local the presence of a weed is considered symptomatic of a certain soil, but not exclusively so. If the association is a general one it is believed to indicate that this species is characteristic of the same type of soil in all districts. There was little evidence found to show an association between weeds and certain crops.

Toxic excreta of plants, F. FLETCHER (*Jour. Agr. Sci., 4 (1912), No. 3, pp. 245–247, pl. 1*).—In a previous publication (E. S. R., 20, p. 521), the author showed an apparent antagonism of sesame to sorghum, the sesame plants not maturing in the presence of the sorghum. The cause of this behavior was attributed to toxic substances secreted by the sorghum roots. Field experiments with maize and sesame have since been carried on in Egypt, and they appear to show the excretion of toxic material by the roots of maize plants.

The injurious influence of tarred roads on neighboring vegetation, L. MANGIN (*Jour. Agr. Prat., n. ser., 22 (1911), No. 35, pp. 271–274, figs. 3*).—On account of conflicting opinions regarding the effect of tarring roads on neighboring vegetation, a commission has been appointed to consider the injury, if any, to the trees and shrubs in the parks of Paris. A summary of the findings of the commission is given, of which the essential conclusions have been noted elsewhere (E. S. R., 25, p. 128).

Herbage studies, I.—Lotus corniculatus, a cyanophoric plant, H. E. and E. F. ARMSTRONG and E. HORTON (*Proc. Roy. Soc. [London], Ser. B, 84 (1912), No. B 574, pp. 471–484*).—Tests have been made of bird's-foot clover (*L. corniculatus*) by means of sodium picrate papers for the presence of hydrogen cyanid. In 1910 the authors concluded that this plant occasionally contained a cyanophoric glucosid and its corresponding enzym. The experiments were repeated in 1911 with specimens of this plant from many regions, and the glucosid and enzym were rarely absent. The experience has led the authors to correlate the appearance in *L. corniculatus* of the cyanophoric glucosid and the attendant enzym with conditions favoring maturity rather than luxuriance of growth.

L. corniculatus major, or *L. uliginosus*, as it is sometimes called, has always proved free from hydrogen cyanid, as have the species *L. tetragonolobus*, *L. siliquosus*, *L. bertholetti*, and *L. jacobæus*.

The authors request botanists to test *L. corniculatus* by the above method and report their results to them.

Investigations on heredity, W. JOHANNSEN (*Fortschr. Naturw. Forsch., 3 (1911), pp. 71–136, figs. 27*).—This is a discussion of heredity as it applies to descent and segregation among plants and animals. A considerable bibliography of the subject is given.

On the cause of dimorphism in Œnothera nanella, H. H. ZEIJLSTRA (*K. Akad. Wetensch. Amsterdam, Proc. Sect. Sci., 13 (1911), pt. 2, pp. 680–685, pl. 1*).—The author for a number of years has been investigating the dimorphism of *Œ. nanella*, one of the forms which is said to have arisen by mutation from *Œ. lamarckiana*. A large number of plants of this species have been studied, and the author has come to the conclusion that *Œ. nanella* is quite constant in its appearance when grown from seed.

In 1905 among these specimens dwarf plants were frequently observed, and a study of them showed in the stems blackened masses, which were found to be made up of Micrococcus. This bacterium is believed to be the agent causing the malformation.

Contribution to the study of buds, PERRIRAZ (*Bul. Soc. Vaud. Sci. Nat., 5. ser., 46 (1910), No. 170, pp. 445–458, figs. 7*).—Anatomical and biological

studies were made of buds of a number of trees, and the author reports that 2 distinct bud forms should be recognized. In the first the bud scales are attached uniformly at the base of the bud, and fall when the young leaves have begun their development. This is true in the case of the ash, horse chestnut, maple, and apple, and the scales function only as protective organs. In the second series the bud scales are arranged in spiral order, and as examples of this the author cites ampelopsis, horn bean, beech, and hazel. In these during the course of their development the scales become modified, develop some chlorophyll, and have the function of young leaves. They fall later, only after the development of the branch and expansion of the true leaves.

Graft hybrids, R. P. GREGORY (*Gard. Chron., 3. ser., 50 (1911), Nos. 1288, pp. 161–163, figs. 3; 1289, pp. 185, 186, fig. 1*).—A description is given of the graft hybrids *Solanum tubingense*, *Cytisus adami*, and *Crataego-mespilus asnieresii*, and their origin as shown by the investigations of Winkler, Heuer, Baür, and others is discussed.

International catalogue of scientific literature. M—Botany (*Internat. Cat. Sci. Lit., 9 (1911), pp. VIII+859*).—This gives a bibliography of botanical literature, most of which appeared in the years 1907–1909, 6,314 references being included. The American literature is much more adequately represented in the present volume than in the previous ones.

FIELD CROPS.

Classification of field crop varieties, F. MERKEL (*Mitt. Deut. Landw. Gesell., 26 (1911), No. 13, pp. 162–166*).—The author classifies German varieties of field crops in accordance with their adaptation to special uses. Potatoes, for instance, are divided into groups of varieties high in yield of tubers, high in starch content, and high in total starch yield. The article deals with wheat, barley, mangels, sugar beets, potatoes, grasses, clover, and various legumes.

[Wisconsin farm crops experiments], H. L. RUSSELL (*Wisconsin Sta. Bul. 218, pp. 15–20, figs. 3*).—At the Ashland substation, the pedigree strains of Green peas yielded at the rate of 50 bu. per acre and of Kharkov winter wheat over 45 bu. per acre.

Western alfalfa seed grown in the latitude of Madison, Wis., proved entirely satisfactory and work done indicates that the vitality of the seed is more important than the variety sown. In soy bean work the number of pods per plant ranged from 30 to over 400.

Tests of commercial bacterial cultures showed "that while in some instances satisfactory inoculation has been secured, they are frequently unreliable, and fail to produce nodules upon the roots of the respective legumes, while inoculation with infected soil has been uniformly successful."

The growing of hemp aided in checking the growth of Canada thistles and quack grass. A 3½-acre field infested with quack grass and Canada thistles was heavily manured, plowed in July, harrowed weekly, and the loose roots removed with a hay rake. A hemp crop sown at the rate of 1 bu. per acre the following spring yielded over 2,100 lbs. of fiber per acre, valued at $118, and "resulted in complete destruction of thistles, and nearly complete annihilation of quack grass."

A solution of 125 lbs. of common salt in 50 gal. of water proved as effective as a 20 per cent iron sulphate solution for the eradication of mustard. The salt is more easily obtained than, and costs about half as much as, the iron sulphate.

Results of cooperative experiments in agriculture, C. A. ZAVITZ and W. J. SQUIRRELL (*Ann. Rpt. Ontario Agr. and Expt. Union, 32 (1910), pp. 14–37*).—

These pages report the results of cooperative tests conducted in Ontario during 1910. The work included variety tests of oats, six-rowed, two-rowed, and hull-less barley, spring and winter wheat, buckwheat, field peas, soy beans, emmer, spelt, mangels, sugar beets, Swedish and fall turnips, carrots, sweet, fodder, and silage corn, millet, sorghum, grass peas, vetches, rape, kale, field cabbage, clover, alfalfa, grasses, field beans, early, medium-ripening, and late potatoes, and winter rye. Fertilizer tests with oats, winter wheat, fodder corn, mangels, Swedish turnips, and potatoes involved the use of nitrate of soda, muriate of potash, superphosphate, and a complete fertilizer, while cow manure also was used with winter wheat, Swedish turnips, and potatoes. These tests covered periods varying from 4 to 8 years. A table states the average results reported from 5 tests of nitrate of soda, muriate of potash, superphosphate, lime, and cow manure singly or in various mixtures in 1910 for barley.

[Fertilizer tests on swamp soils], R. HARCOURT (*Ann. Rpt. Ontario Agr. and Expt. Union, 32 (1910), pp. 44, 45*).—Applications of (1) acid phosphate and sulphate of ammonia, and (2) acid phosphate, sulphate of ammonia, and sulphate of potash were followed by yields of 96 and 176 bu. of potatoes, respectively, as compared with 96 bu. per acre on the check plat. The tests were conducted on swamp soils.

[Adaptation experiments], J. H. HAMPTON (*Rhodesia Agr. Jour., 8 (1911), No. 6, pp. 853–862; 9 (1911), No. 1, pp. 16–23, pls. 4*).—These articles state briefly the results of tests conducted to determine whether certain crops could be profitably grown under southern Rhodesian conditions. The crops tested were alfalfa, Egyptian clover, velvet beans, cowpeas, lupines, peanuts, sweet potatoes, wheat, oats, millet, flax, mangels, sugar beets, swedes, kohl-rabi, carrots, rape, beans, peas, *Paspalum dilatatum*, *Phalaris bulbosa*, and sheep burnet (*Sanguisorba minor*).

[Fertilizer and variety tests], J. JOHNSTON (*Dept. Agr. Brit. East Africa Ann. Rpt. 1910–11, pp. 133–160*).—These pages report the results obtained in fertilizer, variety, and other tests with alfalfa, rape, corn, beans, wheat, mangels, sugar beets, peas, potatoes, barley, *Paspalum dilatatum*, and flax.

Supplementary pasture crops, M. L. FISHER and F. G. KING (*Indiana Sta. Circ. 35, pp. 16, fig. 1*).—A general discussion of forage crops for the hog is followed by special suggestions on growing for this purpose rape, cowpeas, soy beans, Canada peas and oats, rye, oats, vetches, crimson clover, sorghum, artichokes, mangels, sugar beets, carrots, and pumpkins.

Tables suggest crops suitable for planting during each month from April to October, information for use in planting each of a number of crops, and crop successions for "hogging down" in Indiana.

[Chemical and physical observations on Eritrea cereals], O. MANETTI (*Agr. Colon. [Italy], 5 (1911), No. 3, pp. 100–113*).—The crops dealt with are *Sorghum vulgare*, *Elcusine coracana*, *Eragrostis abyssinica*, and *Pennisetum spicatum*. Tables state date gathered in observations of the color, purity, germination, chemical composition, and specific gravity of the seed.

Trials with grains and legumes for feeding purposes, 1899–1908, F. HANSEN (*Tidsskr. Landbr. Planteavl, 18 (1911), No. 4, pp. 485–542*).—The results of trials at 6 Danish experiment stations indicated that for feeding purposes it is generally better to sow a mixture of 100 lbs. oats, 50 lbs. two-rowed barley, 75 lbs. Glänö peas, and 25 lbs. vetches than to sow only a single crop.

Barley alone or mixtures in which barley predominated gave the highest yields on the best soils, while oats or mixtures consisting largely of oats yielded best on the poorer soils.

Eighteen years' culture trials with root crops, L. HELWEG (*Tidsskr. Landbr. Plantcavl, 18 (1911), No. 5, pp. 645–678, figs. 2*).—This report covers cultural tests with mangels, swedes, turnips, and carrots conducted during the period 1906–1910 on 68 different farms (151 experimental fields) in northern and western Jutland, and supplements earlier reports for the period 1893–1905.

The average results for the entire 18 years show that the yield of dry matter was somewhat larger for swedes than for mangels (83.4 and 80.8 cwt. per töndeland, or 61.2 and 59.3 cwt. per acre, respectively), about 25 per cent less for carrots than for mangels, and about 20 per cent less for turnips than for swedes. The special conditions under which the various crops are to be preferred for different sections of the country are discussed, and a rotation intended to guard against insects and fungus diseases is suggested.

The agave, F. MICHOTTE (*Agr. Prat. Pays Chauds, 12 (1912), Nos. 106, pp. 1–15; 107, pp. 150–162, figs. 2*).—A botanical study of the plant and description of its more important characteristics is followed by directions for its propagation and culture, and a statement of its climatic requirements and the results of a chemical analysis.

Soils of the prairie regions of Alabama and Mississippi and their use for alfalfa (*U. S. Dept. Agr. Rpt. 96, pp. 48, pls. 7, figs. 4*).—This report consists of 2 parts.

I. *Houston clay and associated soils*, H. H. Bennett (pp. 5–31).—A previous discussion of the Houston clay has been previously noted (E. S. R., 26, p. 517). The author discusses Houston chalk, Houston loam, and Trinity clay as soils associated with and closely related to the Houston clay. As soils associated with but not closely related to the Houston and Trinity soils he discusses Oktibbeha, Susquehanna, Orangeburg, stream bottom soils associated with Trinity clay, Ocklocknee, and Bibb soils.

II. *Alfalfa on the Houston clay: Its culture and management*, M. A. Crosby (pp. 32–48).—In view of the fact that alfalfa growing is increasing in importance on the Houston clay soils of Alabama and Mississippi, and that climatic and soil conditions here differ from those of other alfalfa sections, the author gives directions for alfalfa production in this region. Special consideration is given to alfalfa on Johnson grass land and on Bermuda sod.

How to grow alfalfa, A. T. WIANCKO and M. L. FISHER (*Indiana Sta. Circ. 36, pp. 16, figs. 6*).—This is in part a reprint of a circular dealing with the production and use of alfalfa in Indiana already noted (E. S. R., 25, p. 440).

On June 2, 1908, a cutting of 285 lbs. of hay was secured from a plat sown on the thirtieth of the previous July, as compared with 315 lbs. from a plat sown August 10, and 135 lbs. and 11 lbs., respectively, from sowings made August 24 and September 12. Of 269 successful alfalfa growers, 196 regarded a nurse crop as unnecessary while 73 favored it.

Genetic studies with the beet, B. KAJANUS (*Ztschr. Induktive Abstam. u. Vererbungslehre, 6 (1912), No. 3, pp. 137–179, pls. 9, figs. 2*).—The author states briefly the results of each of a considerable number of hybridizations in which he used beets of different varieties. The notes given deal particularly with the size, shape, and color of the roots and leaves.

A new plant fiber, A. ZIMMERMANN (*Pflanzer, 7 (1911), No. 4, p. 231*).—The author reports tests of the fine silky hairs from the seeds of a plant determined as *Chlorocodon whitei*. It was found in German East Africa and further experiments in its production have been taken up there.

Local fertilizer experiments with cotton in South Alabama in 1911, J. F. DUGGAR, J. T. WILLIAMSON, L. L. GLOVER, and E. HODSON (*Alabama Col. Sta. Bul. 160, pp. 241–296*).—The results of local fertilizer experiments or soil tests

conducted "to ascertain the best fertilizers or combination of fertilizers for cotton growing on each of the principal soils of the southern half of Alabama" are reported. The applications used and the yields and financial returns obtained on a considerable number of farms are summarized, but no general conclusions are drawn.

Local fertilizer experiments with cotton in North Alabama in 1911, J. F. DUGGAR, J. T. WILLIAMSON, L. L. GLOVER, and E. HODSON (*Alabama Col. Sta. Bul. 162, pp. 56*).—This bulletin is similar to the above, except that it presents studies made in the northern half of Alabama. No general conclusions are drawn.

Cotton culture in North Carolina (*Bul. N. C. Dept. Agr., 33 (1912), No. 2, pp. 36, fig. 1*).—Discussions of the botanical relations of the cotton plant and of the soil, cultural, and other problems connected with its production in North Carolina are followed by tables stating the results of variety tests conducted in 10 different localities in the State. In most instances the yields reported are for 1911, but some of the tables cover the period 1901–1911.

Heading off boll weevil panic, W. E. HINDS (*Alabama Col. Sta. Bul. 159, pp. 225–238, fig. 1*).—A continuation of a previous discussion (E. S. R., 23, p. 55).

A map shows the Alabama weevil line of 1911, including 5 counties and portions of 7 others, and the quarantined area. A review of the boll weevil situation is followed by suggestions to bankers, cotton factors, merchants, and others relative to loans or advances as affected by the boll weevil. It is believed that in most cases loans may continue to be made with safety to the limit of from 50 to 75 per cent of what might be advanced if the boll weevil were not present, provided the grower will so reduce his acreage as to ensure the best of care and will provide for diversification of crops.

Tables showing the acreage devoted to cotton in several States and the average yield secured during certain years since 1894 present data which may be summed up in the following table:

Effect of weevil infestation on cotton acreage and yield per acre.

Year.	Acreage.				Bales per acre.				Percentage of weevil infestation.			
	Ala.	Miss.	La.	Tex.	Ala.	Miss.	La.	Tex.	Ala.	Miss.	La.	Tex.
1894....	2,664,861	2,826,272	1,313,296	6,854,621	0.337	0.435	0.579	0.458	0	0	0	0.25
1898....	3,003,176	2,900,298	1,281,691	6,991,904	.391	.429	.560	.481	0	0	0	11.00
1902....	3,501,614	3,183,989	1,617,586	7,640,531	.279	.455	.548	.326	0	0	0	34.50
1906....	3,658,000	3,408,000	1,739,000	8,894,000	.345	.446	.563	.457	0	0	23.00	71.00
1909....	3,471,000	3,291,000	930,000	9,660,000	.307	.337	.290	.264	0	0.90	100.00	80.00
1910....	3,560,000	3,317,000	975,000	10,060,000	.343	.377	.263	.305	0	14.00	100.00	82.00

British cotton growing, J. H. REED (*Jour. Manchester Geogr. Soc., 26 (1910), No. 4, pp. 179–197, pls. 6*).—The author predicts that unless cotton supplies are obtained from fields other than those of America, the Lancashire industry will completely perish. The British demand for raw cotton is slightly less to-day than it was 25 years ago, but that of other countries has gradually increased. Between 1892 and 1910 the British demand decreased 4 per cent, while that of continental Europe increased 70 per cent and that of the United States 90 per cent. In view of these conditions the author discusses the possibility of increasing the cotton production of India, Egypt, and other British territory.

Seed selection series. I, Broach cotton, T. F. MAIN (*Dept. Agr. Bombay Bul. 46, 1911, pp. 3, pls. 5*).—A description of the ideal broach cotton plant and directions for field selection are accompanied by photographs illustrating the characters to be sought or avoided in obtaining plants of the proper habits and fiber of sufficient length for high-ginning qualities.

Sakellaridis cotton (*Bul. Imp. Inst.* [*So. Kensington*], *9* (*1911*), *No. 3, p. 288*).—This article reports the discovery of a new type of cotton in Egypt by Sakellaridis. It matured earlier than Mitafifi, but flourishes in the same districts and in districts which are not suitable for Yannovitch. The fiber is soft, silky, cream-colored with reddish tinge, of good strength, and from 1.4 to 1.7 in. in length. Experts valued it at 14½ cts. per pound as compared with "fine" Yannovitch at 13¾ cts. per pound.

[Cotton tests at the botanical garden of Palermo], A. BOZZI (*Bol. Min. Agr., Indus. e Com.* [*Rome*], *Ser. C, 10* (*1911*), *No. 5, pp. 1–5*).—The author reports the results of variety tests of tree, Bulgarian, Mitafifi, and American cottons, and hybrids of Trabut and of the colonial or botanical garden of Palermo.

Tests indicated that irrigation aided the development of the plant, but delayed the maturity of the bolls. The drought resistance of the plants leads the author to predict a great extension of cotton culture.

Fertilizing ingredients in Danish hay crops, R. K. KRISTENSEN (*Tidsskr. Landbr. Planteavl, 18* (*1911*), *No. 4, pp. 543–569*).—Chemical analyses are reported showing the nitrogen, phosphoric acid, and potash contents of timothy, rye grass, white, red, and alsike clovers, and of other grasses and legumes grown at the Danish Experiment Station at Askov during the period 1905–1909. The material was obtained from the experiments with hay crops grown under different systems of fertilization on clay, sand, and marsh soils.

A note on onion couch, L. M. UNDERWOOD (*Jour. Agr. Sci., 4* (*1912*), *No. 3, pp. 270–272, figs. 4*).—The author notes the difference of opinion as to whether the bulbous form of *Arrhenatherum avenaceum* is entitled to specific rank and states the results of pot tests conducted on various soils and under different moisture conditions. From these tests, he concludes "that the habit of forming bulbs is hereditary and does not depend on the conditions of the habitat. Other than the bulbs, no differences in habit were noted between the 2 plants."

Potatoes at Wisley, 1911 (*Jour. Roy. Hort. Soc.* [*London*], *37* (*1912*), *No. 3, pp. 569–575*).—Brief descriptions are given of each of more than 70 varieties of potatoes tested.

Six years' potato variety tests at Sindlingen, R. ADLUNG (*Württemb. Wchnbl. Landw., 1912, No. 10, pp. 164–166*).—A table states the yields of tubers and starch obtained during each year of the period 1906–1911 in a test of 34 varieties.

A new potato (*Bul. Union Cent. Synd. Agr. France, 1910, Nov. 1, p. 341; abs. in Internat. Inst. Agr.* [*Rome*], *Bul. Bur. Agr. Intel. and Plant Diseases, 1910, No. 2, p. 248*).—This article discusses a potato variety said to be resistant to attacks of *Phytophthora infestans*. It is stated that the plants reach a height of 2.43 meters.

The thornless prickly pears, D. GRIFFITHS (*U. S. Dept. Agr., Farmers' Bul. 483, pp. 20, figs. 4*).—A statement of the geographical distribution of thornless prickly pears and their moisture, temperature, and soil requirements accompanies directions for propagating, planting, cultivating, harvesting the crop, and transporting the cuttings. Other topics discussed are varieties, the botanical status of thornless prickly pears, and the stability of the spineless character.

[Advice on prickly pear destruction] (*Queensland Bd. Advice Prickly Pear Destruc., Interim Rpt. 1, 1911, pp. 19*).—This report, presented to the houses of Parliament of Queensland, deals with the destruction of the prickly pear by such mechanical means as stacking, burning, rolling, and plowing in, by poisoning with or without subsequent burning, by diseases or insect enemies, and by utilization as fodder or in other ways.

San hemp (Crotolaria juncea), P. C. PÁTIL (*Dept. Agr. Bombay Bul. 47, 1911, pp. 9*).—A botanical description of the plant and statement of its uses is followed by suggestions for growing the crop and retting it.

Grain-sorghum production in the San Antonio region of Texas, C. R. BALL and S. H. HASTINGS (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 237, pp. 30, figs. 4*).—The San Antonio region of Texas is adapted to the production of grain sorghums, but they have failed to set seed. This condition, known as "blast," has been attributed to the removal of pollen by heavy rains during the blooming period. The authors report experiments during which it was discovered that this trouble was caused by the sorghum midge (*Contarinia* (*Diplosis*) *sorghicola*). They also describe attempts to find resistant varieties and state the results of experiments indicating the possibility of avoiding the work of midges by early planting.

Life history studies supplemented by those of Dean (E. S. R., 23, p. 364) are reported. "More than 1,000 [midges] have been hatched from a single head of sorghum. Observations and experiments in 1908 and 1909 failed to find midge-resistant sorghums in any group." In 1910, early planting experiments indicated that the crop could be brought to the blooming stage before the midge was present in sufficient numbers to be very injurious. In 1911, the average yield of all varieties planted March 4 was 23.1 bu., and of the best early variety 32 bu. per acre. Corn on similar land in the same season yielded an average of 10 bu. per acre. Planting as late as April 1 proved unprofitable because of midge injury and drought, but when planted March 15 early varieties yielded very well, while later varieties yielded more poorly. Milo and Dwarf milo maize, Manchu kowliang, and White durra are the earliest varieties. Sudan durra and Dwarf Kafir corn are also promising.

The authors recommend the destruction of Johnson grass and sorghum plants in fence corners and waste places, in order that fewer midges may survive the winter and that the succeeding crops may be more likely to flower without infestation. In view of the results of experiments they also recommend fall plowing for conserving moisture and state that for prompt and uniform germination a thoroughly prepared seed bed is essential. Kowliangs should be planted 5 to 6 in. apart in rows 3½ feet apart, milo maize and durras from 6 to 8 in. apart, and Kafir corn from 8 to 10 in. apart. The date of planting should be as near March 1 as possible, as the risk from late spring frosts is more than compensated by avoiding the midge and drought injury.

Observations on the early flowering of the sugar beet, O. MUNERATI (*Malpighia, 24 (1911), No. 2, pp. 173–187*).—Sowings of 6 varieties of sugar beets at intervals from November 14 to June 15 indicated a decisive effect of the time of sowing on the tendency to premature flowering, but no relation between the number of plants flowering the first year and the yield secured.

Of the beets sown November 15 and December 23, 55 and 65 per cent, respectively, flowered during the first season, but after that time the percentage decreased steadily until of those sown March 14 only about 1 per cent flowered, and of those sown April 26 or later none flowered the first season. The composition of the large, medium, and small beets, as shown by analyses, is reported in tabular form.

Sweet clover, J. M. WESTGATE and H. N. VINALL (*U. S. Dept. Agr., Farmers' Bul. 485, pp. 39, figs. 16*).—This discusses the various species of sweet clover, outlines its status in various sections of the United States, and gives directions for growing, cutting, and curing the crop. Its uses for hay, in rotation as a soiling crop, and as a soil improver are summarized, and directions are given for seed production and for the eradication of the crop when it becomes a weed. White sweet clover (*Melilotus alba*) is the species principally discussed, but the yellow annual and biennial species (*M. indica*) and (*M. officinalis*) are briefly treated. An outline map of the United States shows that localities in 22 States are successfully utilizing sweet clover as a forage crop.

The ordinary slow germination due to hard seed may be overcome by soaking the seed in concentrated commercial sulphuric acid just before sowing and washing rapidly in an abundance of water with frequent changes. Tests of this method gave an increase in germination of from 40 to 45 per cent. Southern grown seed is about 60 per cent, northern grown 43 per cent, and imported seed about 12 per cent hard. The presence of this hard seed, which does not usually germinate the first season, may enable sweet clover to continue in a meadow a number of years without reseeding.

Its habits of growth do not make sweet clover troublesome under ordinary conditions. Its control is especially difficult only under irrigation conditions where old plants along ditch banks furnish seed which is scattered each year by the irrigation water.

The culture of cigar leaf tobacco in Texas, O. OLSON (*Texas Sta. Bul. 144, pp. 3–42, figs. 11*).—A summary of previous tobacco work in Texas carried on by this Department and general information on the production, harvesting, and curing of cigar-leaf tobacco in Texas are followed by statements of work on a tobacco demonstration plat and of the results of experimental work.

The cost of cigar-filler tobacco to the buyer or packer is reported as approximately 25 cts. per pound, including the items of 15 cts. for barn-cured tobacco, 3 cts. for loss in weight during fermentation, 1 ct. for fermentation, 3 cts. for assorting, sizing, and tying, 1 ct. for baling, and 2 cts. for rent, supervision, etc. The total cost per 1,000 cigars for Texas Cuban filler tobacco, and the necessary binders and wrappers is estimated at about $15.25. The cost per acre of growing, stripping, and tying is estimated at $78.

The author states in detail the methods used and results obtained in rotations in fertilizer tests with tobacco, from which he concludes that the average yields of 500 lbs. of Texas Cuban and 800 lbs. of Big Cuban can be increased to at least 1,000 and 1,300 lbs. per acre respectively. In addition to the low yield secured from the check and no-nitrogen plats, the leaves were generally "thin and papery, while the laboratory tests indicated less aroma and flavor and much less ability to stand a heavy fermentation than the tobacco from the highly fertilized plats." Potash alone did not prove conducive to a good yield, although a tobacco grown after its use ranked very high in aroma, flavor, and burn. Phosphoric acid caused a rapid and highly desirable growth, and the author recommends the use of 16 per cent acid phosphate. The methods used in the seed beds are briefly stated, and a table gives the grades awarded the tobacco grown on each of 12 fertilizer plats, in accordance with score card points.

Notes are given on the varieties and types grown on the variety and breeding plats.

Cultural tests of Herzegovina tobacco in Italy, ABBATE (*Bol. Tec. Coltiv. Tabacchi [Scafati], 10 (1911), No. 3, pp. 161–164*).—These experiments were conducted in Comiso, Italy, on soils of different types.

Water content of soil and nitrogen fertilization in relation to the development of Göttingen bearded square-head winter wheat in different vegetation periods. K. MEYER (*Ueber den Einfluss verschieden hohen Wassergehalts des Bodens in den einzelnen Vegetationsstadien bei verschiedener N-Düngung auf die Entwickelung des Göttinger begrannten Squarehead-Winterweizens. Inaug. Diss., Univ. Göttingen, 1908. pp. 90, pls. 3*).—These tests were conducted in zinc pots 33 cm. high and 25 cm. in diameter. Each contained 20 kg. of soil to which had been added 1 gm. of potash in potassium carbonate and 1 gm. of phosphoric acid in monocalcium phosphate. To some 1.5 gm. of nitrogen in nitrate of soda was added, and to others only 0.5 gm. of nitrogen. The water content of the soil was maintained at 45 per cent of its absolute water-holding capacity during the first vegetation period, and at 70 per cent during the rest of the test. In other cases this order was reversed.

From the data presented the author draws the following conclusions: The water consumed is less in case of high nitrogen fertilization, and high water content of the soil markedly increases the total yield only in case much nitrogen is present. The ratio of grain to straw is reduced by the presence of a large amount of moisture if plant food is not present in sufficient quantity. Grain formation is favored by an increase in the amount of water present during the last vegetation period.

Tillering is influenced by nitrogen fertilization and the amount of water present. The weight of the roots is increased by nitrogen fertilization and by an increase in the amount of water present, but the same root mass will produce more grain and straw on a fertile soil than on a thin soil. The total length of haulm depends generally on the water content of the soil during shooting. Tillering is unfavorable to length of haulm only when the soil is deficient in plant food. Potash fertilization does not determine the relative length of internodes and haulms. The length of the upper internode is influenced by the water content of the soil, particularly at the time of shooting, while the length of the lower internodes depends on the water content during the first vegetation period. Abundant fertilization and soil moisture increase the strength of the straw and weight of head. Tillering reduces strength of straw and weight of head only when accompanied by lack of plant food. The water supply during the first vegetation period governs the length of head and the number of kernels per head. Barren spikelets result from unfavorable water and food conditions. Increased moisture at the time of shooting gave the lowest number of barren spikelets in the case of high nitrogen fertilization.

Nitrogen fertilization rather than the water content of the soil appeared to be of importance in determining the number of blossoms per spikelet; it also favored symmetry of head. The less nitrogen there is available the more the soil moisture influences symmetry of head. In case of change in the amount of water, only a high moisture content during the first period exerted an unfavorable influence on the symmetry of head.

Other things being equal, the length of beard increased with length of head. Insufficient moisture during the first vegetation produced long beards, but much moisture produced a weak development of beard. There appeared to be no constant relation between length of beard and weight of grain. The longest beards appeared higher on the head than did the heaviest kernels.

With low nitrogen fertilization the heaviest kernels appeared in the lower portion of the ear, while high nitrogen fertilization apparently resulted in a tendency for the heavy kernels to appear at the middle of the head. The 1,000-kernel weight varied with the soil moisture in case of the heavier application of nitrogen. Plant food was low if much moisture was applied at an

early stage to the pots with only 0.5 gm. of nitrogen. Excessively high nitrogen fertilization with continued droughts reduced the 1,000-kernel weight.

By grouping the haulms and heads with reference to fertilization and the amount of water supplied the author obtained quite regularly graded series of data on length, weight, fruitfulness of head, and 1,000-kernel weight. The regularity of this gradation was also maintained in case of the number of kernels per head when much water was supplied during the first vegetation period.

Report of the Danish seed control station, 1910–11, K. Dorph-Petersen (*Tidsskr. Landbr. Planteavl, 18 (1911), No. 5, pp. 679–718*).—These pages summarize the results of purity and germination tests, made during the period 1901–1911, of 9,024 samples of seeds of 32 species of clovers, grasses, root crops, and small grains. The frequency of occurrence of various weed seeds is stated.

[Tests of Bombay seeds], I, G. D. Mehta (*Dept. Agr. Bombay Bul. 49, 1911, pp. 27*).—The results of analyses and germination tests of seeds commonly grown in the Ahmednagar district of Bombay are reported.

HORTICULTURE.

Report on the government horticultural gardens, Lucknow, for the year ended March 31, 1911, H. J. Davies (*Rpt. Govt. Hort. Gardens Lucknow, 1911, pp. 8*).—A progress report discussing administrative affairs, conditions of the gardens, character of the season, acclimatization and other experiments, financial results, and miscellaneous work.

Report of the fruit branch of the department of agriculture, Ontario, 1910, P. W. Hodgetts et al. (*Rpt. Fruit Branch Dept. Agr. Ontario, 1910, pp. 167, figs. 41*).—This report contains a general survey of the work of the fruit growers' and bee-keepers' associations, the experimental fruit stations, nursery inspection, and orchard surveys, together with other cooperative and miscellaneous work of the year.

Return of inspections of fruit and vegetables for year ended June 30, 1911, E. G. E. Scriven (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1910–11, p. 10*).—A statistical review of the export and import fruit and vegetable trade of Queensland.

Spraying to control the important insects and fungus diseases affecting the fruit and foliage of the apple, W. M. Scott (*Thomsen Chem. Co. Circ. 4, 1912, pp. 26, pls. 4*).—A practical treatise based largely upon the results secured from the work of this Department and the State experiment stations.

Orchard spray calendar, M. W. Richards (*Indiana Sta. Circ. 34, pp. 12, figs. 12*).—This circular contains a complete spraying schedule for orchard fruits, with recommended formulas for preparing the materials and the approximate time of application for those which are most important and most generally used.

Lime-sulphur wash, L. Caesar (*Ontario Dept. Agr. Bul. 198, 1912, pp. 44, figs. 28*).—This bulletin summarizes the results of the latest investigations and experiments in making lime-sulphur wash and the various uses to which it can be applied.

Valencia melon industry, R. Frazer, Jr. (*Daily Cons. and Trade Rpts. [U. S.], 15 (1912), No. 106, pp. 474, 475*).—An account is given of the winter melons grown in the Valencia district, with reference to varieties, methods of planting, and seed selection.

Onions, A. McMeans (*Ontario Dept. Agr. Bul. 199, 1912, pp. 24, figs. 14*).—A reprint of a survey of the onion industry in Ontario, Michigan, Indiana, Illinois, and Ohio, previously noted (E. S. R., 21, p. 236).

The pear and how to grow it, G. B. Brackett (*U. S. Dept. Agr., Farmers' Bul. 482, pp. 31, figs. 30*).—This is a popular treatise on pear culture based on practical experience.

The subject matter is discussed under the following general headings: Dwarf and standard trees, propagation, location of the orchard, fertilizers, planting the orchard, selection of trees, cultivation, cover crops, pruning and training, protection from rodents, diseases and insect enemies, thinning the fruit, gathering the fruit, sorting and grading, packages, the fruit room, and disposing of the crop. Abridged descriptions are given of select varieties of pears.

The plums of New York, U. P. Hedrick et al. (*New York State Sta. Rpt. 1910, pt. 2, pp. XII+616, pls. 100*).—This is the third of a series of monographs on the fruits of New York (E. S. R., 20, p. 940). Although the work has a special significance for New York State, its contents are considered sufficiently general to be offered as a record of the present knowledge of cultivated plums and to be applicable to the whole country and more or less to the world.

In the first chapter the history and general characters of plums are discussed; a conspectus showing the relations of the species to each other is given; and each species is described and discussed in detail relative to its literature, botanical characteristics, and varietal groups. Chapter 2 discusses the present status of plum culture in America under the following headings: Climate, the pollination of plums, locations and soils, stocks and propagation, plum orchards and their care, harvesting and marketing, diseases, and insects. A table is given showing the averages of the blooming dates at the New York State Station of varieties of plums for the 8 years 1902 to 1909. Chapter 3 describes the leading varieties of plums. The technical descriptions are for the most part original and the aim has been to give a concise idea of all of the characters of each variety. Synonyms and important references are also given. Chapter 4 contains briefer descriptions of the minor varieties of plums.

The color plates of species and leading varieties are a valuable adjunct to the text. A bibliography is given containing all horticultural books in America dealing with the plum, together with the European books and all periodicals referred to in the volume.

Report on orcharding and the wine industry, H. Brönnle (*Pflanzer, 7 (1911), No. 12, pp. 722–742*).—A report on the development of the fruit and wine industries in German East Africa, including information relative to cultural practices, principal insect pests and diseases, and their control.

Grape culture, E. R. Farrar (*Agr. of Mass., 1910, pp. 151–155*).—A short article on commercial grape culture with special reference to Massachusetts conditions.

The family strawberry patch and the way to make it a success, W. Boulton (*Alpena, Mich., [1911], pp. 62*).—A popular treatise on this subject.

Roselle, its cultivation and uses, P. J. Wester (*Philippine Agr. Rev. [English Ed.], 5 (1912), No. 3, pp. 123–132, pls. 2, fig. 1*).—An account of the roselle (*Hibiscus sabdariffa*) relative to its history, botany, and geographical distribution; varieties; soil, planting, and cultivation; harvesting and yield; composition and uses; diseases; and insect pests.

The only disease that has been thus far noted on the roselle is the mildew (*Oïdium* sp.), which was found in Florida to attack the plant in the cool, damp fall nights. This is easily controlled by dusting with dry sulphur when the plants are wet with dew.

The Sour orange bud as a remedy for gummosis of citrus trees, L. Savastano (*R. Staz. Sper. Agrum. e Frutticol. Acireale, Bol. 7, 1912, pp. 4, figs. 2*).—A popular bulletin, in which the author calls attention to the value of Sour

orange stock for citrus trees which are apt to be attacked by gummosis, and also to the practice of inserting Sour orange buds beneath the wounds of trees already attacked by gummosis. These buds, which are allowed to grow for 2 or 3 years, appear to arrest the disease and the wound becomes callused over. When the buds become too rank in growth they are removed and the operation is repeated by starting 1 or 2 new Sour orange buds below the wound. This method is of special value for renewing old lemon trees.

English walnuts, W. F. ALLEN (*Lawrenceville, N. J., 1912, pp. 29, pls. 4, figs. 3*).—This comprises a compilation of information relative to planting, cultivating, and harvesting English walnuts.

Making a lawn, L. J. DOOGUE (*New York, 1912, pp. 51, pls. 8*).—A handbook on lawn making, the successive chapters of which discuss the small lawn, old, and new; the treatment of large areas; grass seed; sowing the seed; sodding; good loam and fertilizers; the lawn mower, roller, and hose; and weeds and other pests.

Amateur gardencraft, E. E. REXFORD (*Philadelphia and London, 1912, pp. 300, pls. 34*).—A popular treatise on ornamental gardening.

Consideration is given to making and planting the lawn, shrubs, vines, the hardy border, the garden of annuals, the bulb garden, the rose, the dahlia, the gladiolus, lilies, plants for special purposes, arbors, summer houses, pergolas, and other garden features, together with a memorandum of operations for the year.

Garden profits, E. L. D. SEYMOUR (*Garden City, N. Y., 1911, pp. 245, figs. 57*).—A practical treatise on city and suburban gardening.

One hundred and fifty small gardens, C. HAMPEL (*150 kleine Gärten. Berlin, 1910, 4. enl. ed., pp. IV+202, figs. 150*).—This work contains plans, descriptions, and planting suggestions for 150 small gardens, representing both formal and natural arrangements and combinations of the two.

Let's make a flower garden, HANNA R. VERBECK (*New York, 1912, pp. 208, pls. 31*). —A popular treatise on flower gardening, containing information relative to cultural details, garden arrangement, suitable plants, etc.

Orchids, J. O'BRIEN (*New York [1912], pp. IX+114, pls. 8*).—A popular treatise on orchid culture, including information relative to diseases and insect pests, hybridizing, and raising seedling orchids, and an enumeration of the principal genera and species in cultivation.

Carnations and pinks, T. H. COOK, J. DOUGLAS, and J. F. MCLEOD (*New York [1912], pp. IX+116, pls. 8, figs. 2*).—A popular treatise containing historical notes, cultural details, and information relative to different types and varieties of carnations and pinks.

The work concludes with a calendar of operations.

FORESTRY.

The elements of British forestry, J. NISBET (*Edinburgh and London, 1191, pp. XII+345, figs. 92*).—A handbook for forest apprentices and forestry students.

The subject matter is presented under the general headings of silviculture, the management and protection of woodlands, and the utilization of woodland produce.

Forestry for woodmen, C. O. HANSON (*Oxford, Eng., 1911, pp. 222, pls. 12, figs. 15*).—A popular work on scientific forestry, based largely on the important literature on the subject, and prepared especially for practical foresters and woodmen.

The successive chapters discuss the life history of a tree; tree growth in relation to climate and soil; pure and mixed woods; nursery management; sowing and planting in the forest; tending of woods; methods of treatment; protection of woods against destructive animals, birds, and insects, weeds and fungi, and against frost, drought, storms, and fires; silvicultural notes on broad-leaved trees and conifers; fencing and draining; felling and measurement of timber; working plans; and the uses of British timber.

Wood and forest, W. NOYES (*Peoria, Ill., 1912, pp. 309, figs. 140*).—A handbook of information relative to the sources, growth, properties, identification, and uses of the common American woods.

The successive chapters discuss the structure and properties of wood, the principal species of American woods, the distribution and composition of the North American forests, the forest organism, natural enemies of the forest, the exhaustion of the forest, and the use of the forest. Information for distinguishing different woods is appended, also a general bibliography on wood and forestry.

Sixty-six species of American woods are considered relative to their habitat, characteristics of the tree, appearance of wood, physical qualities, and common uses. Illustrations are given in each case of the leaf of the tree and of the radial, tangential, and cross sections of the wood. The woods are also listed in order of their weight, strength, elasticity, and hardness.

On forest types, A. K. CAJANDER (*Fennia; Bul. Soc. Geogr. Finlande, 28 (1909), No. 2, pp. IV+175*).—This comprises a detailed study of the forest flora in a number of German forest districts, conducted principally to determine to what extent a knowledge of plant groups is of value for scientific forestry investigations and for practical forestry. A similar study of the forms in the vicinity of Brixen is appended.

For the region studied the author found that the dominant forest forms fell into a comparatively small number of types, which were readily characterized by certain dominant plants of the ground flora. The forest types were widely distributed and the same type was found to occur at altitudes ranging from 5 meters to 600 meters. The author concludes that the occurrence of a forest type is not exclusively influenced by any one factor, such as the physical and chemical composition of the soil, exposure, altitude, etc., since the same type is found on various soils and exposures. The forest types appear to be much more the result of the total effect of locality factors than as formations which occur on similar biologic localities. The ground vegetation does not appear to be materially influenced by the dominant tree or trees. Each forest type appears to have a special growth energy. The accretion of the same timber species in different types is quite variable, but within the same type there are no great differences. Within one and the same forest type similar regeneration and silvical methods are applicable to the same timber species.

Experiments on the periodicity of some tropical trees, H. DINGLER (*Sitzber. K. Bayer. Akad. Wiss., Math. Phys. Kl., 1911, No. 1, pp. 127–143*).—In order to throw some light on the cause of the normal leaf fall which occurs with many native species in Ceylon during the drought period in March, the author conducted pruning experiments with many of the species growing in the Peradenyia Botanic Garden and Experiment Station and elsewhere.

The results, as here tabulated and discussed, show that if the trees are pruned in the fall the resulting vigorous new leaf growth formed in December passes through the normal leaf-fall period without dropping off. From these results the conclusion is formed that the normal leaf fall of these tropical trees can not be attributed primarily to external conditions of the temperature, moisture, etc., and that measures taken to control the temperature and moisture

conditions will not prevent the normal leaf fall. The cause of the leaf fall, which appears to lie in part at least within the plant, has not been thus far determined.

On the periodicity of central European deciduous trees in the mountain climate of Ceylon, H. DINGLER (*Sitzber. K. Bayer. Akad. Wiss., Math. Phys. Kl., 1911, No. 2, pp. 217–247*).—In connection with the above investigation the growth performance of a number of deciduous forest and fruit trees, native to Central Europe and growing at Nuwara Eliya and Hakgala in the mountains of Ceylon, was observed.

From the data thus far secured the author is led to conclude that the temperate climate trees, when thus transferred to the tempered tropical mountain climate at the above named places, make 2 growth cycles in a year with little, if any, resting period between. The first cycle commences in spring and ends in fall, at which time the trees recommence their life activities almost immediately, the cycle ending by spring. The leaves from the summer growth are carried over into the late winter, when conditions seem favorable for their falling off without at the same time seriously retarding the development of the new growth.

This continuous growth performance, however, appeared to weaken the reproductive activities of both the forest and fruit trees observed. Many kinds of trees matured their fruit but the yield was much less than in their native land. Vegetative development was greater in a number of cases, as with oaks, pears, cherries, and to a certain degree peaches, and less in other cases, such as the red beech and birch, than in the natural habitat of these trees.

It is stated that no conclusion can be drawn as yet from the information at hand as to the cause of this variation.

The strength, elasticity, and other properties of New South Wales hardwood timbers, W. H. WARREN (*Sydney: Dept. Forestry, N. S. Wales, 1911, pp. 100, pls. 16, figs. 67*).—This report gives the results of the following tests commenced in 1907 and continued up to December, 1910: Compression tests of cubes to determine any variation in strength of wood growing at different heights above the ground; the strength and elasticity of large and small timber beams; the strength and elasticity of long and short columns subjected to compression; shearing and tensile strength of timber; the holding power of nails and spikes; the compressive strength across the fiber; hardness and torsion tests; resistance to wear in floors and street pavements; impact; and tests of beams. The tests were made on various eucalypts, as well as with the turpentine tree (*Syncarpia laurifolia*), brush box (*Tristania conferta*), and the colonial teak (*Flindersia australis*). The testing methods are fully described and the results are tabulated and further explained by numerous diagrams and illustrations.

A careful consideration of the results obtained from the tests of cubes taken from 5 sections of the tree shows that with the same moisture content present in each case, the timber cut from the highest section is slightly, but not materially, stronger than that cut from the other 4 sections. Each timber was found to have a characteristic strength moisture curve beyond a certain point in which additional moisture does not seriously reduce the strength. Diminution of moisture below this point, on the other hand, produces an important increase in strength, which is much greater in some timbers than in others. The results illustrate the importance of seasoning on the strength of timber and also indicate that certain timbers exposed to the weather may become considerably reduced in strength.

Hevea brasiliensis, G. VERNET (*Bul. Écon. Indo-Chine, n. ser., 14 (1911), Nos. 92, pp. 777–826; 93, pp. 917–944; 15 (1912), No. 94, pp. 40–98, figs. 7*).—

Part 1 of this study treats in detail of the preparation and industrial value of different grades of raw Para rubber. Part 2 deals with the culture and exploitation of Para rubber in the Malayan Peninsula, in Java, and in Ceylon.

On the anatomy of Hevea brasiliensis and Manihot glaziovii with reference to tapping, P. Arens (*Meded. Proefstat. Malang, 1911, No. 1, pp. 3–11, figs. 5*).—A short descriptive account.

An irrigation method for tapping Hevea, T. Wurth (*Meded. Proefstat. Malang, 1911, No. 1, pp. 15–18, figs. 2*).—A method of providing a small but constant supply of water to the tapping incisions is described and illustrated.

[Tapping experiments] (*Ann. Rpt. Agr. Dept. South. Nigeria, 1910, pp. 9–14, 34–36, 39*).—Experimental tappings of Ceara and Para rubber trees made at different points in Southern Nigeria are reported.

On the coagulation of the latexes of some Euphorbias, A. Zimmermann (*Pflanzer, 7 (1911), No. 12, pp. 742–744*).—The latexes of a number of Euphorbias were successfully coagulated with a 1 or 2 per cent solution of tannin.

On heath burning for reforestation, E. Wibeck (*Meddel. Stat. Skogsförsöksanst. (Mitt. Forstl. Vers. Anst. Schwedens), 1911, No. 8, pp. 7–94, figs. 35*).—During the period 1888 to 1893 a number of experimental areas were established in the heath districts of Sweden to determine the best silvicultural methods for these soils, a special study being made of the effect of burning over the lands previous to reforestation. The results secured on these areas are here reported in detail.

The species planted were pine, spruce, and birch. Regardless of soil and cultural methods the pine alone has made good growth. Burning over the land appears to increase the growth in some localities and to check it in others. Generally speaking, deep soils with a medium amount of moisture show the greatest improvement from burning over. Burning during dry periods is apt to cause injurious ground fires. Burning off the vegetation from dry, sandy soils, shallow soils, and wet soils is of doubtful value and may even prove harmful.

From 2 to 3 times as much seed was necessary to secure a stand on unburned land as on burned land.

A new sowing method in the mountains, Hauenstein (*Forstw. Centbl., n. ser., 34 (1912), No. 4, pp. 207–217, figs. 3*).—A hand seed drill for sowing forest seed in rough mountainous lands is described and illustrated.

The Spranz seed sower, Schinzinger (*Allg. Forst u. Jagd Ztg., 88 (1912), Apr., p. 143, fig. 1*).—A hand apparatus for broadcasting coniferous seeds is illustrated and described.

Progress report of forest administration in Baluchistan for 1910–11, Mulraj and H. Dobbs (*Rpt. Forest Admin. Baluchistan, 1910–11, pp. III+34*).—This is the customary report of the forest conservator relative to the constitution, management, exploitation, and administration of the state forests in Baluchistan, including a financial statement for the year 1910–11. The principal data are appended in tabular form. The report is reviewed by the revenue commissioner.

DISEASES OF PLANTS.

Bacteria in relation to plant diseases, II, E. F. Smith (*Carnegie Inst. Washington Pub. 27, vol. 2, 1911, pp. VIII+368, pls. 20, figs. 148*).—This is in continuation of the author's monograph on the diseases of plants due to bacteria, the first volume of which has been noted elsewhere (E. S. R., 17, p. 263). In the first volume the general subject of bacteria and methods of work was discussed, while in the second volume the history of the subject, general considerations, and vascular diseases are treated.

After a very full review of the early literature relating to bacterial diseases of plants, the author takes up and treats of the occurrence of bacteria in plants, methods of their entrance, inception and progress of disease, reaction of the host, individual and varietal resistance, etc. An extended chapter is devoted to the subject of symbiosis, particular attention being given to that occurring between *Bacterium leguminosarum*, or *Pseudomonas radicicola*, and its host plants, the Leguminosæ. The author considers the organism in this case a restricted parasite. Other forms of symbiosis are described at some length. The subject of the possibility of the transfer to plants of bacteria known to cause diseases of animals receives attention. The use of germicides in the treatment of seeds and dormant and growing plants is discussed and formulas for numerous fungicides and insecticides are given.

In the second part of the volume the author begins the consideration of specific diseases. Plant diseases due to bacteria are classified by him into 3 groups, vascular diseases, parenchyma diseases without hyperplasia, and cankers, galls, and tumors in which there is a more or less distinct hyperplasia. The diseases described in the present work are the cucurbit wilt due to *Bacillus tracheiphilus*, the black rot of cruciferous plants due to *Bacterium campestre*, and the yellow disease of hyacinths caused by *Bacterium hyacinthi*. Each of these diseases is extensively treated, the symptoms, cause, distribution, characters of the parasite, methods of control, etc., being described. Numerous references to literature are given in connection with the several topics.

[Notes on plant diseases and their control], H. L. Russell (*Wisconsin Sta. Bul. 218, pp. 20–23*).—Notes are given on investigations carried on at the Wisconsin Station on the use of fungicides, tobacco diseases, and the influence of cold on spore germination of certain rusts (E. S. R., 26, p. 342), and a plant disease survey.

It is reported that experiments by O. R. Butler indicate that lime sulphur proved inefficient in controlling the shot-hole fungus of the cherry, and that it also caused in several instances considerable damage in strong sunlight.

The investigations on tobacco diseases by J. Johnson include seed-bed diseases due to *Pythium debaryanum*. The results indicate that soil treatments are not to be recommended, and emphasize the importance of sterilization of the seed bed through burning by fires or with steam. A study was begun on the stem rot of tobacco, and 2 types of fungi, a Fusarium and a Trichothecium, were found in connection with the disease.

In the report on the plant disease survey, L. R. Jones calls attention to a serious leaf blight of barley due to Helminthosporium, losses of 25 to 75 per cent of the crop being noted. Fungus diseases of orchards are said to have been rather uncommon, due to the dry conditions prevailing during the summer. The cherry leaf spot was particularly destructive in some localities, and the crown gall and hairy root are said to be becoming serious. Climatic injuries, due to unseasonable weather conditions, were more or less conspicuous, and the author notes considerable trouble caused by Septoria and Ascochyta on peas and the Fusarium and Phoma diseases of cabbages. Attention is called to the necessity for the adoption of precautionary measures against the introduction of such diseases.

Some new or little-known plant diseases in Britain, F. J. Chittenden (*Jour. Roy. Hort. Soc. [London], 37 (1912), No. 3, pp. 541–550*).—Notes are given on lettuce leaf rot due to *Marssonia panattoniana*, leaf spot of Campanula caused by *Ramularia macrospora*, and a streak disease of sweet peas which is attributed to *Thielavia basicola*.

The lettuce leaf rot is probably identical with that described by Selby (E. S. R., 8, p. 990), where the fungus was identified as *M. perforans*.

The streak disease of sweet peas is said to be characterized by brown streaks along parts of the stem and a yellowish tinge in the foliage, which fails to develop properly. The flower buds become yellow and drop without opening, or, in less advanced cases, open and show brownish or yellowish marks on the petals.

An examination of plants affected by this disease showed the presence of the fungus *T. basicola*, and a series of experiments was planned to determine methods of control. In pots which were made acid or alkaline by the addition of fertilizers, sweet peas were planted and half the pots inoculated with the fungus, but in no case did the resulting plants show any indication of disease. In a subsequent experiment the plants after attaining a growth of about 1 ft. in height were heavily overwatered and kept so for several days. The effect of this was very marked. Those in the uninoculated soil were slightly checked in growth, but with proper treatment subsequently as regards watering they recovered, while 75 per cent of those in the inoculated soil showed the development of the disease. It appears that the fungus attacks only the plants that have in any way been weakened, and care should be exercised to secure a good active growth to prevent the appearance of the disease.

Physalosporina, a new genus of Pyrenomycetes, N. Woronichin (*Ann. Mycol., 9 (1911), No. 3, pp. 217–225; abs. in Bul. Trimest. Soc. Mycol. France, 27 (1911), No. 3, p. 399*).—A description is given of the genus and of the 6 species studied, also a comparative table of the characters of these species, named as follows: *P. megastoma*, *P. obscura*, *P. astragalina*, *P. astragali*, *P. caraganæ*, and *P. tranzschelii*.

New studies on Plasmodiophoraceæ, R. Maire and A. Tison (*Ann. Mycol., 9 (1911), No. 3, pp. 226–246, fig. 1; abs. in Centbl. Bakt.* [*etc.*], *2. Abt., 32 (1912), No. 6–12, pp. 328, 329*).—The authors here make a fuller report and continuation of previous work (E. S. R., 21, p. 423; 25, p. 43), summarized as follows:

Tetramyxa parasitica is one of the Plasmodiophoraceæ, its endophytic development being similar in the main to that of other members of the family. Fungi of the genus Ligniera, which also belongs to this family, develop in roots of various plants but do not produce tumescence. The parasite *T. triglochinis* is separated to form a new genus, Molliardia.

The relation of the family to the allied forms is also discussed.

Scleropycnis, a new generic type, H. and P. Sydow (*Ann. Mycol., 9 (1911), No. 3, pp. 277, 278, figs. 4; abs. in Bul. Trimest. Soc. Mycol. France, 27 (1911), No. 3, pp. 401, 402*).—A comparison is made of closely related species with this new form, which is described under the name *S. abietina* n. sp.

A culture study of Hyalopsora polypodii, P. Dietel (*Ann. Mycol., 9 (1911), No. 5, pp. 530–533; abs. in Ztschr. Landw. Versuchsw. Österr., 14 (1911), No. 12, p. 1477*).—It is claimed as a result of these investigations with Hyalopsora on *Cystopteris fragilis*, continued for 2 years, that this fungus can and does normally preserve and perpetuate itself by means of uredospores. These live through the winter and renew the fungus which, so far as its mycelium is concerned in the cases studied, dies out completely before spring. Teleutospores appeared rarely in these experiments and their rôle in the case of this fungus was not ascertained.

Parasitism of Nectria and Fusicladium, E. Voges (*Centbl. Bakt.* [*etc.*], *2. Abt., 32 (1912), No. 20–25, pp. 540–551, figs. 2*).—Continuing previous studies (E. S. R., 24, pp. 448, 450), the author discusses the nutritive relations of species of Fusicladium and Nectria, holding as the result of observations by himself and others that while Nectria is to be considered only a so-called "wound-parasite" Fusicladium is a true parasite.

Infection studies with Peronospora, G. von Istvanffi and G. Palinkas (*Centbl. Bakt. [etc.], 2. Abt., 32 (1912), No. 20–25, pp. 551–564*).—Continuing previous investigations (E. S. R., 25, p. 751), the authors made a study of Peronospora on beet and grape leaves by artificial infection of separated leaves and of plants growing in the open in wet and in dry weather and at varying temperatures, in order to ascertain the period of inoculation and the influence of relative humidity, temperature, and condition of the plant on its liability to develop the infection.

It was found that rapidity of development was variable, and that high relative humidity of the air, high water content of the plant, and sudden lowering of temperature all tended to render the plant more open to attacks by the fungus. Dryness tended to retard advance of the disease when already present.

The infection of forage grasses by ergot, E. Gain (*Compt. Rend. Soc. Biol. [Paris], 72 (1912), No. 5, pp. 189–191*).—It having been claimed that the spores of certain ergots, especially that of Lolium, require passage through the intestinal tract of insects to secure their germination, the author conducted some experiments with about 30 specimens of *L. perenne, Arrhenatherum elatius, Phleum pratense,* and *Holcus lanatus* to determine the rôle of insects in the spread of ergot among these grasses.

Inoculation experiments showed that ergot could be readily produced, but that insects played a secondary rôle, merely acting as carriers of the spores as in pollination, and that they were not essential to the dissemination of the fungus or to the infection of the host plant.

The use of iron sulphate for the control of the rust of plants, C. Fuschini (*Rivista [Conegliano], 4. ser., 17 (1911), No. 19, pp. 443–446; abs. in Internat. Inst. Agr. [Rome], Bul. Agr. Intel. and Plant Diseases, 2 (1911), No. 11–12, p. 2600*).—A preliminary account is given of experiments by the author on the application of considerable quantities of iron sulphate to the soil for the prevention of the rusts of wheat and beans.

In the experiments iron sulphate was added to the soil at the rate of 1.6 cwt. per acre for wheat and 2.4 cwt. for beans, after which the seed was planted. No difference could be noted for the wheat the following season, as there was but little rust in the vicinity. With the beans there was a considerable increase in weight of both the seed and plants. This is attributed to the use of the iron sulphate, which induced a much more vigorous vegetative growth.

The author is of the opinion that the application of iron sulphate before planting may be of use in preventing rusts in various crops through the general increase in the vigor of the plants, so that they can better resist the attacks of fungi.

A practical view of root rot of beets, H. Briem (*Ztschr. Zuckerindus. Böhmen, 36 (1911), No. 1, pp. 23–25*).—After a brief discussion of some opinions regarding the nature of this disease and remedies therefor, the author states that his experience leads him to the conclusion that a plentiful supply of lime in the soil in available form and the thorough aeration of the soil by means of the hoe are the most effective means for combating this disease.

Rice blight, J. S. Collier (*Illinois Sta. Circ. 156, pp. 19, figs. 11*).—In continuation of a previous report (E. S. R., 24, p. 743) and preliminary to an extended statement giving the entire data and the results of the experiments, the author gives an account of his investigations on rice fields in Arkansas.

The disease seems to be wholly a physiological one, and is not to be confounded with blights caused by insects or fungi. The root is the part of the plant affected, and the nutrition of the plant is so impaired that the grain does not develop. The results show that a good physical condition of the soil, with aeration at the proper time, will prevent blight. It is not caused by deep

flooding, and moving water diminishes the amount. Mineral salts had no effect on the disease, nor did the addition of ground limestone, aside from the general effect it had on the growth of rice through improved biological conditions.

From the results of the experiments, the author suggests that the disease may be controlled by the preparation of the soil and the seeding of the rice when the soil is in good condition to work. Rice should be flooded for the first time when it is about 8 in. high, barely covering the land with water for 6 or 7 weeks. At the time the head is forming in the "boot" the water should be drained off and the soil aerated for 2 or 3 weeks, after which the fields are again to be flooded to a depth of about 3 in. for 4 or 5 weeks. The water should be gradually drained off until time to dry for harvest.

Preliminary study of the red rot of sugar cane in the Bombay Presidency, G. S. KULKARNI (*Dept. Agr. Bombay Bul. 44, 1911, pp. 8, pls. 3*).—The red rot disease due to *Colletotrichum falcatum* has become a serious trouble in some of the cane-growing regions of India. The distribution of the disease and symptoms are described.

From the author's observations it appears that the infection is most commonly through the use of diseased cane for planting. For the prevention of the disease it is urged that the sets be carefully examined and only those that show white pith at the cut ends be selected for planting. Any that show the slightest reddening should be destroyed.

The life history of the plum rust in England, F. T. BROOKS (*New Phytol., 10 (1911), No. 5–6, pp. 207, 208; Gard. Chron., 3. ser., 50 (1911), No. 1295, p. 292; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 11–12, pp. 2603, 2604*).—A severe epidemic of plum rust (*Puccinia pruni*) is said to have prevailed in fruit plantations of Cambridgeshire, England, the trees often being prematurely defoliated. There has been some doubt as to how the fungus survives the winter. Both uredospores and teleutospores are produced on plum leaves, but experimental proof is lacking that they can survive the winter and infect the leaves of the plum the following season.

Experiments by the author, in which æcidiospores of *Æcidium punctatum* from *Anemone coronaria* when placed on plum leaves produced the disease, confirm the claim of the heteræcism of *P. pruni*. The mycelium is perennial in Anemone and gives rise to crops of uredospores year after year, so that a few plants attacked by the æcidium are sufficient to account for the recurrence of the plum rust. After the first crop of uredospores has been produced on the plum leaves the fungus spreads rapidly on that host. Plants of Anemone affected by the fungus are said to have more fleshy leaves and to flower very rarely.

The eradication of plants of *A. coronaria* affected by the æcidium is suggested as a means of controlling this disease.

Experiments on the control of chlorosis of fruit trees, G. RIVIÈRE and G. BAILHACHE (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 33 (1912), No. 11, pp. 314–317*).—Experiments are reported on the treatment of pear trees for chlorosis.

The trees were fed a solution of pyrophosphate of iron with ammonium citrate through holes near the base of their trunks. Inserted in the holes were tubes connected with vessels holding the solutions of the chemical. The solution, it is said, did not precipitate tannin and close the vessels of the wood, as is the case when some other iron compounds are used. Ten-year-old pear trees took up more than 14 liters of the solution, corresponding to 0.7166 gm. of the pyrophosphate of iron, in 87 days of the experiment. The chlorotic appearance of the trees was changed to a healthy one.

Resistance to chlorosis, A. VERNEUIL and R. LAFOND (*Rev. Vit., 36 (1911), No. 927, pp. 321–326*).—During 1911 chlorosis appeared very destructive in certain regions of France to varieties of grapes hitherto considered resistant even when planted in lime soils. The season was a very rainy one and followed an unusually wet year. Previously, chlorotic vines treated with iron sulphate had given good crops, but in 1911 all failed.

A study was made of the vines, and especially of the maximum quantity of lime in the soils where the more resistant varieties could grow without showing chlorosis. The resistance to lime was found to vary with the different varieties, and the depth and character of the subsoil were found to influence materially the growth of the vines. Some varieties of grapes were found to tolerate as much as 45 per cent of lime in the soil, while the ordinary Riparia stock will not withstand much more than 10 per cent. In deep rich soils that are not excessively moist the tolerance was even higher. The authors claim that in the establishment of vineyards which are to remain for many years the depth and character of the subsoil must be taken into consideration.

Infection of grapes by downy mildew, J. J. KRANKOFF (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 33 (1912), No. 11, pp. 334, 335*).—A brief account is given of spraying experiments for the control of mildew, which in 1911 was successfully combated by early and repeated sprayings. The application was made almost exclusively to the upper side of the leaves, thus confirming the conclusions of Ravaz and Verge (E. S. R., 26, p. 550).

The conditions necessary for the appearance of downy mildew, L. RAVAZ and G. VERGE (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 33 (1912), No. 10, pp. 296–300*).—A study has been made of the relation of temperature to the appearance of the conidia of the downy mildew, *Plasmopara viticola* (E. S. R., 26, p. 851). Infested leaves were kept in thermostats and the temperature and time required for the appearance of the characteristic white spots of the mildew were noted.

None appeared at temperatures below 13° C., but they did show after 20 hours at that temperature. At about 20° the development is most rapid, a single day or night with this temperature accompanied by suitable humidity being all that is needed to induce a rapid growth. The development is somewhat slower at higher temperatures. In the spring of the year the temperature and other conditions at Montpellier are said to be seldom suitable before May 27 to promote the rapid spread of the fungus, while in autumn the conditions are usually very favorable and frequent successive invasions of the fungus are to be expected.

Experiments in the treatment of grapevine mildew in the Bombay Presidency, W. BURNS (*Dept. Agr. Bombay Bul. 45, 1911, pp. 15, pls. 4*).—An account is given of spraying experiments in which Bordeaux mixture was used for the control of the downy and powdery mildews of grapes. Two years' work has shown that thorough and timely spraying greatly reduces the loss commonly due to these fungi. The author notes the apparent resistance of one variety to mildew and frost injury.

The relation of meteorological conditions to diseases of the mulberry, G. ARNAUD and F. LAFONT (*Ann. École Nat. Agr. Montpellier, n. scr., 11 (1912), No. 3, pp. 169–215, figs. 25*).—A report is given on the relation of weather conditions to attacks of *Nectria cinnabarina* and *Coryneum mori* on the mulberry, the studies on the former having been carried on at Montpellier, while the report on the latter is largely based on the work of Butler (E. S. R., 22, p. 51). So far as the Nectria is concerned, and probably the same is true for the Coryneum, the authors believe that their occurrence as parasites on the mulberry is associated with the injury of the developing buds by late spring frosts. The

diseases at times are very destructive, especially where the mulberries are pruned closely.

Notes are also given on mulberry diseases due to *Bacterium mori*, *Gibberella pulicaris*, and *Botrytis cinerea*.

Banana diseases, W. FAWCETT (*West India Com. Circ., 27 (1912), No. 351, pp. 125, 126*).—Accounts are given of the Panama disease due to *Ustilaginoidella musæperda* (E. S. R., 25, p. 349); the Surinam disease of bananas, which occurs with the Panama disease, but is distinct from it; the "Moko" plantain disease, due to *Bacillus musæ* (E. S. R., 25, p. 148); and the root disease caused by a species of Marasmius.

The Panama disease of the Gros Michel banana in Surinam, A. W. DROST (*Dept. Landb. Suriname Bul. 26, 1912, pp. 45, pls. 11*).—According to the author's investigations, this disease was present in Surinam before the Gros Michel or Jamaica banana had been introduced. He claims that it is caused by the fungus *Leptospora musæ*.

The fungus penetrates through the root hairs, following the central bundle of the roots, and then spreads to the bulb and ascends into the vascular bundles of the leaf stalk. It attacks principally the bundles where suckers have been cut from the mother plant under the surface of the soil, and as a rule it does not reach the blade of the leaf. Besides perithecia, it is said to produce spores of a Cephalosporium and of a Fusarium type. Inoculations from pure cultures gave positive results.

The fungus was found to attack different varieties of Musa. It lives for a long time in the soil, from which it may infect new plantings. On this account soils once infected are said to be always unfit for Gros Michel banana cultivation. The moisture content of the soil is said to influence the susceptibility of bananas to the disease. The varieties of *M. paradisiaca* vary in their liability to infection by it, some varieties being practically immune.

The banana disease (*Jour. Jamaica Agr. Soc., 16 (1912), No. 2, pp. 90–92*).—An account is given of the occurrence of the Panama banana disease in Jamaica.

Die-back or exanthema of citrus trees, E. O. ESSIG (*Pomona Col. Jour. Econ. Bot., 1 (1911), No. 2, pp. 73–82, figs. 2*).—The author has brought together much of the information concerning die-back of citrus trees, which it is held is due to physiological causes.

The withertip disease in Florida, P. H. ROLFS (*Pomona Col. Jour. Econ. Bot., 1 (1911), No. 3, pp. 107, 108*).—A brief account is given of the withertip of citrus trees as it occurs in Florida, and the author notes its frequent occurrence in California. For the control of this disease the best method in Florida is said to consist of thorough orchard sanitation followed by vigorous pruning out of the affected branches.

New fungi occurring on orange leaves, H. REHM (*Pomona Col. Jour. Econ. Bot., 1 (1911), No. 2, p. 106*).—Technical descriptions are given of *Mycosphærella lageniformis* n. sp. and *Scleroplea aurantiorum* n. sp., which occur on orange leaves in southern California.

Notes on Scleroplea aurantiorum and Mycosphærella lageniformis, C. W. METZ (*Pomona Col. Jour. Econ. Bot., 1 (1911), No. 3, pp. 109, 110, fig. 1*).—Supplementing the technical descriptions of these fungi (see above), the author gives an account of their attack on the host plants. The leaves upon which the fungi are found resemble those affected with withertip, due to *Colletotrichum glæosporioides*. Both species are often found on the same leaf, but the larger perithecia of Scleroplea usually serve to distinguish them.

The author believes that the information at hand is not sufficient to justify conclusions relative to the economic importance of the fungi, whether they are both parasitic or not.

A new Mycosphærella from Saxony, W. KRIEGER (*Ann. Mycol., 9 (1911), No. 3, p. 216; abs. in Bul. Trimest. Soc. Mycol. France, 27 (1911), No. 3, p. 398*).—The new species, described and named *M. virgaureæ*, is said to have been found in May, 1909, on leaves of *Solidago virga aurea* of the previous year's growth.

Mycological notes, F. VON HÖHNEL (*Ann. Mycol., 9 (1911), No. 3, pp. 213–216; abs. in Bul. Trimest. Soc. Mycol. France, 27 (1911), No. 3, p. 398*).—The results are here given of a study of *Coniodictyum chevalieri*, which is alleged to cause galls on twigs and leaves of Zizyphus and to be identical with the fungus otherwise named *Hyalodema evansii* (E. S. R., 24, p. 252).

The slime disease of Cyathea medullaris, P. SORAUER (*Ber. Deut. Bot. Gesell., 30 (1912), No. 1, pp. 42–48, pl. 1*).—This is a study by the author of a liquefying disease of this fern, said to be somewhat similar to gummosis, and associated with the presence of a fungus which is described and placed in the genus Nectria.

The Japanese chestnut at the experiment station at Lindois, A. PRUNET (*Bul. Soc. Nat. Agr. France, 72 (1912), No 2, pp. 131–137; Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 8, pp. 522–524; abs. in Rev. Sci. [Paris], 50 (1912), I, No. 9, p. 285*).—In continuation of previous observations on the resistance of Japanese chestnuts to the black canker or root disease (E. S. R., 23, p. 49), the author reports experiments in which trees from 1 to 4 years old of common and Japanese chestnuts were planted in localities known to be badly infested as well as in a region where the disease was less prevalent.

Of 89 trees of the common chestnut planted in the badly diseased area, 86 died and 3 were badly infested. Of 48 common trees planted in less infected soils 33 died. In noninfected regions all remained sound. No Japanese chestnut trees were lost due to attacks of this disease, although 90 were planted in different situations.

A disease of the beech, P. MAGNUS (*Sitzber. Gesell. Naturf. Freunde Berlin, 1911, No. 10, pp. 436–439*).—The author calls attention to a disease observed on beech in the Rhine region which quickly killed trees from 70 to 80 years old, and which he declared to be caused by a saprophytic fungus, *Agaricus mucidus*, also called by several other names. The question as to the proper systematic placing of the species is also discussed.

Fungus galls on the beech, M. MÖBIUS (*Ber. Senckenb. Naturf. Gesell., 42 (1911), No. 1, pp. 7–12, figs. 3*).—A description is given of *Cyttaria darwinii*, a fungus that causes galls on twigs and branches of *Fagus betuloides*, a beech native of the Southern Hemisphere.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

A history of British mammals, G. E. H. BARRETT-HAMILTON (*London, 1911, vol. 1, pts. 4, pp. 25–32+169–208, pls. 4, figs. 5;.5, pp. 33–40+209–248, pls. 3, figs. 5; 6, pp. 41–48+249–263, pls. 3, fig. 1; vol. 2, pts. 6, pp. 24, figs. 20; 7, pp. 25–72, pls. 4, figs. 3; 8, pp. 73–120, pls. 5, figs. 2; 9, pp. 121–168, pls. 4, figs. 6; 10, pp. 169–216, pls. 4, figs. 11*).—This is a continuation of the work previously noted (E. S. R., 25, p. 150).

The Vespertilionidæ are taken up in parts 4 and 5 and the Rhinolophidæ in parts 5 and 6 of volume 1. Volume 2 deals with the land mammals. The order Insectivora is first taken up; the Talpidæ, or common moles, are dealt with in parts 6 and 7; the Erinaceidæ, or true hedgehogs, in parts 7 and 8; the Soricidæ, or shrews, in parts 8 and 9; and the Rodentia in parts 9 and 10.

Some common mammals of western Montana in relation to agriculture and spotted fever, C. BIRDSEYE (*U. S. Dept. Agr., Farmers' Bul. 484, pp. 46, figs. 34*).—This bulletin is based on investigations conducted in western Montana for several years, especially in the Bitter Root Valley, in cooperation with the Bureau of Entomology of this Department and with the Montana Station. A circular relating to the subject has been previously noted (E. S. R., 25, p. 756).

The author concludes that the most feasible ways of controlling Rocky Mountain spotted fever, which is transmitted from wild animals to human beings by the bite of infected ticks, are: "(1) To educate the inhabitants of infested localities in a belief in the 'tick theory;' (2) to lessen the number of wood ticks, by (a) keeping domestic stock, the principal hosts of the adult ticks, tick free and (b) lessening the number of native rodents, the necessary hosts of the younger states of the ticks; and (3) to destroy those native rodents which may serve as a source of continued reinfection of the ticks."

Directions for poisoning and otherwise destroying rodents are presented.

Analysis of the results of 87 fecal examinations of sheep dogs for evidences of parasitism, W. D. FOSTER (*Science, n. ser., 35 (1912), No. 901, pp. 553, 554*).—This is a brief statement of the results of examinations of collie and sheep dogs imported to this country, made while in quarantine.

All the dogs examined that were found to be infested with tapeworms were given a suitable tæniafuge. Of 87 dogs examined, 50 were infested with parasitic worms, and of these 28 were infested with nematodes only, while the remainder were infested with tapeworms of 1 or more species or of tapeworms and nematodes. Of the 22 dogs infested with tapeworms, 7 were infested with *Tænia hydatigena*, 8 with *T. pisiformis*, 4 with *Dipylidium caninum*, 2 with *Multiceps serialis*, and 8 with unidentified Tænia.

The author is inclined to believe that the small percentage of infestation shown in the examination is the result of the greater care bestowed on valuable animals.

A new species of trematode from the muskrat, Fiber zibethicus, F. D. BARKER and J. W. LAUGHLIN (*Trans. Amer. Micros. Soc., 30 (1911), No. 4, pp. 261–274, pl. 1*).—The trematode here described as *Notocotyle quinqueseriale* n. sp., is one of a large number of trematodes, representing several species, that were found in the alimentary canal of muskrats, near Calloway, Nebr.

Microbes killing mice and rats, A. VOYTKEVICH and A. KOLENEV (*Vîestnik Bakt. Agron. Stantsii V. K. Ferrcĭn, 1911, No. 18, pp. 97–153*).—An extended discussion of the subject.

Raticide—Azoa, S. S. MERESHKOWSKY (*Centbl. Bakt. [etc.], 1. Abt., Orig., 62 (1912), No. 1–2, pp. 72–75*).—The author's investigations led him to conclude that the commercial preparation known in England by the name Raticide and in America as Azoa can not be recommended for use in destroying rats.

The food of birds of India, C. W. MASON and H. MAXWELL-LEFROY (*Mem. Dept. Agr. India, Ent. Ser., 3 (1912), Jan., pp. 371*).—This paper is said to be a compilation from various sources of what little is known of the food of Indian birds at the present time. It also contains numerous field notes on the food of the common species of the plains, together with the records of 1,325 stomachs examined in the laboratory.

Chronology and index of the more important events in American game protection, 1776–1911, T. S. PALMER (*U. S. Dept. Agr., Bur. Biol. Survey Bul. 41, pp. 62*).—This bulletin contains a brief historical summary of game legislation in this country and related matters, a chronology from 1776 to 1911 of State and Federal legislation and other data of interest, and a subject index to the chronology.

A contribution to the physiology and morphology of the digestive apparatus of insects, C. SCHLÜTER (*Ztschr. Allg. Physiol., 13 (1912), No. 3, pp. 155–200, pls. 3*).—This account includes a bibliography of 42 titles.

Insect pest survey, H. L. RUSSELL (*Wisconsin Sta. Bul. 218, pp. 23–25*).—It is stated that following the nearly complete loss of fruit by the late spring freeze in 1910, the majority of fruit insects were left without their normal food, and, consequently, but few completed their life cycle for winter hibernation. The codling moth and plum curculio were almost entirely eliminated as destructive factors in fruit growing in some regions. The pear slug is said to be reaching proportions where much damage is annually occasioned to the cherry and plum. The apple aphis was unusually abundant during the year, and the growth of young trees stunted thereby. The cottony maple scale was again abundant, and the asparagus beetle was reported from several sections. Both the onion thrips and onion maggot are causing severe losses in the trucking regions in the southeastern part of the State. Locusts or grasshoppers were unusually destructive in some sections, likewise the blister beetles, which have caused no little injury to alfalfa and vetch. The damage by blister beetles is partly atoned for by the good which their larvæ accomplish in feeding on grasshopper eggs which they destroy by the thousands.

Farmers' foes and their remedies (*Dept. Agr. Brit. Columbia Bul. 24 [1908], pp. 200, figs. 73*).—This compilation deals largely with insect pests occurring in British Columbia and remedial measures therefor. A chapter on plant diseases is included.

Insect pests in the West Indies in 1911 (*Agr. News [Barbados], 11 (1912), No. 254, pp. 26, 27*).—This is a brief account of the more important insect pests of the year in the British West Indies.

Insect notes for the year 1910–11, P. L. GUPPY (*Bd. Agr. Trinidad Circ. 3, 1911, pp. 3–14, figs. 2*).—This paper, which is a more extended account than that previously noted (E. S. R., 25, p. 357), deals with the insect enemies of cacao, rubber, tobacco, cotton, and other crops.

Miscellaneous notes, F. W. URICH (*Bd. Agr. Trinidad Circ. 3, 1911, pp. 15–25, fig. 1*).—Miscellaneous papers are here presented. The first, which relates to ants on cacao estates, includes a preliminary list of 69 forms of Trinidad ants; the second deals with rats and other mammals on cacao estates; the third consists of notes on insecticides, etc.

[Destructive insects, 1910] (*Bd. Agr. and Fisheries [London], Ann. Rpt. Intel. Div., 1910–11, pt. 2, pp. 27–38, pl. 1*).—Among the more important insects considered in this report are the grapevine phylloxera, the large larch sawfly (*Nematus erichsonii*), the potato tuber worm, the cherry fruit fly (*Rhagoletis cerasi*), the narcissus fly (*Merodon equestris*), etc.

Report of the entomological section of the Wellcome Tropical Research Laboratories, H. H. KING (*Rpt. Wellcome Research Labs. Gordon Mem. Col. Khartoum, 4 (1911), B. Gen. Sci., pp. 95–150, pls. 7, figs. 30*).—The author first reports upon animals injurious to man and animals, including mosquitoes and their control; blood-sucking flies other than mosquitoes, particularly tabanids, with a list of blood-sucking flies recorded from the Anglo-Egyptian Sudan with the localities in which they are known to occur; Œstridæ; and ticks. The animals injurious to farm and garden crops considered include the Dura stem-borer (*Sesamia cretica*), the black or greasy cutworm (*Agrotis ypsilon*), the asal fly (*Aphis sorghi*), the cotton stem borer (*Sphenoptera neglecta*), the melon weevil (*Baris tragardhi*), the melon stem borer (*Apomecyna binubila*), the melon leaf beetle (*Aulacophora foveicollis*), the diamond-back moth (*Plutella maculipennis*), the cabbage bug (*Bagrada picta*), the rigla gall weevil

(*Baris lorata*), the fig stem-boring beetle (*Sinoxylon sudanicum*), white ants, and the black garden ant (*Aphænogaster barbara*).

The plants diseases ordinance of 1910 is appended to the report.

Suppression of the cotton white scale in Piura, C. H. T. Townsend (*Bol. Dir. Fomento [Peru], 9 (1911), No. 3, pp. 1–7*).—This paper briefly considers the cotton white scale (*Hemichionaspis minor*), the cotton square weevil (*Anthonomus* sp., probably *vestitus*), the cotton strainer (*Dysdercus ruficollis*), etc.

Insect pests of jute, H. L. Dutt (*Dept. Agr. Bengal, Quart. Jour., 5 (1911), No. 2, pp. 107–110*).—This important fiber crop has several important insect enemies, including leaf feeders and capsule and stem borers. Particular mention is made of the indigo caterpillar (*Laphygma exigua*), the jute semilooper (*Cosmophila sabulifera*), and the "behar" hairy caterpillar (*Diacrisia obliqua*).

The enemies of rye, P. Noel (*Bul. Lab. Régional Ent. Agr. [Rouen], 1911, No. 4, pp. 4–7; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 11–12, p. 2023*).—The author lists 37 insect enemies of rye.

Fruit flies and other insects attacking cultivated and wild fruits in New South Wales, W. B. Gurney (*Agr. Gaz. N. S. Wales, 23 (1912), No. 1, pp. 75–80, pls. 2, figs. 9*).—This third paper (E. S. R., 26, p. 150) deals with the island fruit fly (*Trypeta musæ*), the tomato fly (*Lonchæa splendida*) which sometimes attacks citrus fruit, the ferment fly (*Drosophila obscura*) which attacks all classes of damaged fruit, fruit-eating beetles of the genus Carpophilus, and the identification of fruit fly maggots.

New control methods for the pear thrips and peach tree borer, E. L. Morris (*California Sta. Bul. 228, pp. 367–374, figs. 6*).—The investigations of control measures for the pear thrips here reported are based on experiments conducted during 1910 and 1911 in a pear orchard near San José, Cal. Experiments carried on in 1910, in which applications of whitewash were made in different amounts by spraying before the buds were open sufficiently to admit the thrips, resulted in finding the number of blossoms to be in direct proportion to the amount of whitewash applied. The trees which had a thin coating of whitewash had very few blossoms, while those which had a very thick coating of whitewash had an abundance. The amount of fruit corresponded to the number of blossoms.

In 1911 the experiment was repeated on a larger scale. An application of lime made with a view to showing that the whitewash would have the same beneficial effect when applied a week or more before the buds open, as when applied at the time of opening, was rendered worthless by an untimely downpour of rain. A second application made just as the buds were beginning to open gave results similar to those of 1910. All the sprayed trees came into full bloom and the unsprayed trees blossomed very feebly; the fruit corresponded very closely to the blossoming, the sprayed trees averaging 8 times as much as the unsprayed trees.

Eighty lbs. of quicklime was used to make 100 gal. of spraying material, the whitewash being strained through a 1/14 in. mesh wire screen and the same sized screen used on the suction hose of the pump. The ordinary Bordeaux nozzles worked well, but it was necessary to enlarge slightly the opening in the disks of the Vermorel type nozzles.

The work with the peach tree borer (*Sanninoidea pacifica*), an insect of much economic importance in the horticultural district around the southern arm of San Francisco Bay, was conducted at Berryessa, Cal. Experiments by the author led to the use of hard asphaltum, grades "C" and "D" with good

results. "This was applied early in the spring to badly infested trees from which the borers had not been dug. It was found that a thick heavy coating prevented both the issuance and the entrance of about 95 per cent to 98 per cent of the insects, the degree of efficiency depending upon the thoroughness of the application. Asphaltum does not penetrate, crack, deteriorate, or bind the tree, since it yields to the slightest pressure. Four years of experimenting have not shown the least injury." The material while warm was applied from 5 in. below to 5 in. above the ground by means of a brush. Two coatings are said to be generally sufficient, unless the bark is very rough. The borer is seldom uniformly distributed over an orchard, and it is not necessary that all of the trees be treated with asphaltum, although it is necessary to examine them carefully in order to discover those that are infested. The author has also used asphaltum to a limited extent for covering wounds and for grafting.

Roaches and their extermination by the use of sodium fluorid (NaF), M. F. GATES (*U. S. Naval Med. Bul., 6 (1912), No. 2, pp. 212–214*).—The author finds that the cockroach can be quickly, cheaply, and completely eliminated from ships or houses by the use of sodium fluorid. Since the insects do not take it voluntarily but lick it off their feet it should be dusted thinly but widespread where they are most numerous. It must be kept dry in order to adhere to the feet of the roaches.

The rice grasshopper (Hieroglyphus banian), L. C. COLEMAN and K. K. KANNAN (*Dept. Agr. Mysore, Ent. Ser. Bul. 1, 1911, pp. 52, pls. 5, figs. 4*).—This is a detailed account of studies of the rice grasshopper, including its life history and preventive and remedial measures.

South American Acridoidea, L. BRUNER (*Ann. Carnegie Mus., 8 (1911), No. 1, pp. 5–147*).—Two hundred and three species are here considered of which 10 genera, 61 species, and 1 variety are described as new to science.

Information relative to the enemies of the olive in the Province of Jaén, L. NAVARRO (*Bol. Agr. Téc. y Econ., 3 (1911), No. 33, pp. 797–809*).—*Phlœothrips oleæ* appears to be a most important insect enemy of the olive in the Province of Jaén, which is located in the southern part of Spain.

Kala-azar and the bedbug (*Lancet [London], 1912, I, No. 8, p. 520*).—A discussion of some recent investigations.

Test sprayings for the gloomy scale (Chrysomphalus tenebricosus), Z. P. METCALF (*Jour. Econ. Ent., 4 (1911), No. 6, pp. 515–521*).—"The gloomy scale is the most important insect enemy of shade trees in North Carolina, and is well distributed over all this State south and east of the mountains. Its importance is due to 2 factors, the enormous rapidity with which it breeds and the fact that it is all but completely confined to the soft maples which have been so largely used for shade purposes in our cities and towns."

The experiments here reported led the author to conclude that any of the soluble oils 1:8 or 1:10 are satisfactory remedies if used while the tree is dormant, one application being sufficient for several years where the infestation is slight or moderate. Where the scale is serious 2 or more applications are advisable.

"None of the commercial lime-sulphur washes were as satisfactory for controlling the gloomy scale as the soluble oils. This we believe is accounted for by the fact that the dorsal scale of this insect is thicker and applied more closely to the ventral scale than is the case in the San José scale. Our observations would lead us to believe that the oils owe their superior killing powers to the fact that they remain moist much longer than the lime-sulphur preparations and are thereby enabled to creep in between the dorsal and ventral scales. The corrosive lime-sulphur washes do not seem to be able to penetrate the thick

dorsal scale of this insect. Some of the lime-sulphur washes gave fair results and if spraying for the gloomy scale could be repeated year after year, as in the case of the San José scale, they might be recommended. But with shade trees this is usually not practicable. None of the spring applications were at all satisfactory, and it was impossible to see that any of the trees sprayed in the spring had been benefited to any marked degree."

Apropos of Aleyrodes olivinus, C. CAMPBELL (*Abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 7, p. 1836*).—The author calls attention to the fact that *A. olivinus*, described by Silvestri (E. S. R., 26, p. 149) as a new olive parasite in central and southern Italy, and recently recorded by Chapelle as a new olive pest in Spain, is not only found in Italy but also in Tunis, where the author has himself found specimens. He has also noted its presence in Smyrna.

The larger canna leaf-roller (Calpodes ethlius), F. H. CHITTENDEN (*U. S. Dept. Agr., Bur. Ent. Circ. 145, pp. 10, figs. 8*).—During the year 1911 the canna leaf-roller was abundant in various parks in the District of Columbia, at West Grove, Pa., and at points as far south as Orlando, Fla. This circular describes its injury and method of attack, distribution, stages, life history and habits, natural enemies, and methods of control.

The caterpillars of this butterfly appear to attack only plants of the genus Canna, when these are obtainable, at times utterly destroying luxuriant plants. Attention is attracted to its injury by the large irregular areas which are cut away from the margin of the canna leaves. The larva cuts a small, more or less oblong strip about ½ in. long from the edge of the leaf and folds it over on the lower surface. Within this nearly flat flap it lies concealed, feeding above and below its retreat. As it increases in size the larva makes large incisions in the leaf's edge with a correspondingly large flap, and later forms large tubular retreats. A portion of the lower side of the leaf is at times folded over the upper surface. On August 24, 1907, this pest was present in all stages in great abundance on canna at Orlando, Fla.

The species, which is of tropical origin, appears to be killed by severe frosts. So far as can be learned it is known to exist permanently in the United States only in the Gulf States, South Carolina, and Porto Rico. It also inhabits Cuba and Jamaica, and in South America occurs as far south as Argentina.

The eggs, which are laid singly and separately, sometimes in groups of from 5 to 7 on the undersurface of the leaves, hatch in from 4 to 6 days. The larva is said to pass through 5 stages. The egg parasite *Pentarthron minutum* has been observed to be an important enemy at Orlando, Fla. Handpicking has been successfully practiced in parks at Washington, D. C., as has the squeezing of the leaves with gloved hands. Paris green and arsenate of lead with or without Bordeaux mixture can be used with little danger of poisoning, although their use appears to be undesirable where children have access to the plants.

Combating the cochylis and eudemis moths, G. DALMASSO (*Staz. Sper. Agr. Ital., 43 (1910), No. 7–9, pp. 593–645*).—This is a report of experimental studies of remedial measures for these grapevine pests, conducted at Milan.

A note on some mucedines observed on Cochylis ambiguella, G. FRON (*Bul. Trimest. Soc. Mycol. France, 27 (1911), No. 4, pp. 482–487, pl. 1*).—This paper relates chiefly to *Botrytis bassiana* (=*Spicaria bassiana*) and *Spicaria verticillioides* n. sp.

Observations on lamp traps for the cochylis moth, V. VERMOREL (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 32 (1911), No. 29, p. 70; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 7, pp. 1819, 1820*).—In experiments conducted by the author an acetylene lamp was placed in a tray at one end of a large closed room, 50 meters (164 ft.) long, and after-

wards cochylis and eudemis moths, which had been bred in captivity, were liberated at different distances from the lamp. When liberated not more than 25 meters from the lamp the cochylis moths flew to the lamp and were drowned in the tray; the eudemis moths seemed to be unaffected by the light at that distance.

The potato moth, A. H. COCKAYNE (*Jour. New Zeal. Dept. Agr., 2 (1911), No. 4, pp. 179–186, figs. 4*).—This is an account of the life history and of control measures for the potato tuber worm, a severe outbreak of which was experienced in the South Island, New Zealand, the 1911 crop being very materially affected in certain localities.

The light brown apple moth (Tortrix [Cacæcia] responsana), C. FRENCH (*Jour. Dept. Agr. Victoria, 10 (1912), No. 2, pp. 111–113, fig. 1*).—This moth, which is found in most parts of Victoria, is said to be a very destructive insect, attacking almost any kind of garden plant, as well as apples and other fruits.

The Microlepidoptera of the vineyard, F. PICARD (*Prog. Agr. et Vit. (Ed. l'Est Centre), 32 (1911), No. 15, pp. 448–469, pl. 1, fig. 1*).—This is a summarized account of information relating to the grapevine pyralid (*Œnophtira pilleriana*), the cochylis (*Cochylis ambiguella*), and the eudemis (*Polychrosis botrana*) moths.

The "schlaffsucht" of the meal moth caterpillar, E. BERLINER (*Ztschr. Gesam. Getreidew., 3 (1911), No. 3, pp. 63–70*).—This paper reports experiments in which the caterpillars of the meal moth were inoculated, moistened, and fed with the causative bacterium. It was found to possess a high virulence, 100 per cent mortality resulting in some instances, both when applied externally and when ingested.

The Mycetophilidæ of North America, Part III, O. A. JOHANNSEN (*Maine Sta. Bul. 196, pp. 249–328, pls. 5*).—In this third part (E. S. R., 23, p. 762) of the author's work on the fungus gnats, the subfamily Mycetophilinæ is dealt with. The work includes tables for the separation of the genera and species. Numerous species are described as new to science.

"As far as known all of the species of this subfamily pass the earlier stages in mushrooms or decaying wood. The larvæ of several species of Exechia and of Mycetophila are occasionally found in cultivated mushrooms, *M. punctata*, quite frequently. This species is also particularly common in wild mushrooms, at times very few plants escaping infestation. Mushroom growers need expect but little trouble from these pests if they will provide their cellars with fine mesh wire screens."

The identity of the better known midge galls, E. P. FELT (*Ottawa Nat., 25 (1912), Nos. 11, pp. 164–167; 12, pp. 181–188*).—This is a descriptive list of some of the earlier named species of cecidomyids.

New West Indian gall midges, E. P. FELT (*Ent. News, 23 (1912), No. 4, pp. 173–177*).—In this paper the author describes as new to science *Bruggmanniella pisoniæ*, reared from the stems of *Pisonia nigricans; Mycodiplosis pulvinariæ*, the larvæ of which were found preying upon *Pulvinaria pyriformis; Arthrocnodax meridionalis*, reared from Eriophyes galls, including galls of *Eriophyes gossypii* on Sea Island cotton; and *Hyperdiplosis producta*, reared from what presumably were mite galls in the inflorescence of *Stachytarpha jamaicensis*. All were from St. Vincent Island.

Second contribution to the knowledge of the Brazilian species of Simulium, A. LUTZ (*Mem. Inst. Oswaldo Cruz, 2 (1910), No. 2, pp. 213–267, pls. 4*).—In this second paper (E. S. R., 23, p. 762), which is principally systematic, 17 species are described as new to science.

Dr. A. Lutz's studies of Brazilian Simuliidæ, F. KNAB (*Proc. Ent. Soc. Wash., 13 (1911), No. 3, pp. 172–179*).—The first part of the work reviewed in

this paper has been previously noted (E. S. R., 23, p. 762); the second part is noted above.

The evolution of Trypanosoma evansi through the fly: Tabanus and Stomoxys, F. S. H. BALDREY (*Jour. Trop. Vet. Sci., 6 (1911), No. 3, pp. 271–282, pls. 2*).—In the observations reported many hundreds of flies were used and 500 slides examined, and in no case was development of the parasite further advanced than in the spore or piroplasmic form observed. "This appears to indicate that the development was either arrested or that the cycle is completed in another way, probably through the egg of the fly or by a second cycle through a mammalian animal."

Observations of the tachinid parasite of the nonne moth (Parasetigena segregata), F. TIMAEUS (*Naturw. Ztschr. Forst u. Landw., 9 (1911), No. 2, pp. 89–95, fig. 1*).—This paper, which includes a note by K. Escherich, under whose direction the studies were conducted, deals with the incubation period of the eggs and the entrance of the larvæ into the host.

References are given to literature on the subject.

The control of the olive fly and Prof. Lotrionte's experiments (*Abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 7, pp. 1836–1838*).—A study made by G. Lotrionte of aromas or scents most attractive to the olive fly, the influence of colored light, etc. is here summarized.

Glucose was found much more attractive than molasses. An olive grove about 1 kilometer from other olive groves and sprayed 4 or 5 times with a mixture of glucose diluted with 20 per cent of water and 2 per cent of copper sulphate, was scarcely infected (0.33 per cent) whereas groves which had not been thus treated were infected to an extent of from 9 to 23 per cent. All olive trees treated with this mixture were in excellent condition, and free from sooty mold and from attack by Cycloconium.

Numbers and types of bacteria carried by city flies, J. C. TORREY (*Jour. Infect. Diseases, 10 (1912), No. 2, pp. 166–177*).—"Flies examined up to the latter part of June were free from fecal bacteria and carried a homogeneous flora of coccal forms. During July and August there occurred periods in which the flies examined carried several millions of bacteria, alternating with periods in which the number of bacteria were reduced to hundreds. The scanty flora probably indicated the advent of swarms of recently hatched flies. Fecal bacteria of the colon type were first encountered in abundance the early part of July. The bacteria in the intestines of the fly were 8.6 times as numerous as on the surface of the insects. On the surface of the flies the colon group bacteria constituted 13.1 per cent of the total; and within the intestine 37.5 per cent of the total.

"Of the lactose fermenters, isolated and identified, 79.5 per cent belonged in the colon-aerogenes group and 20.5 per cent in the acidi lactici group. Fifteen cultures of streptococci, isolated and identified, were distributed among the equinus, fecalis, and salivarius groups. There were none of the pyogenes type. The most important isolations were 3 cultures of *B. paratyphosus*, Type A.

"Bacteria of the paracolon type causing a final intense alkaline reaction in litmus milk and fermenting only certain monosaccharids were frequently encountered during August."

Contribution to the knowledge of the biology of European rat fleas (Ceratophyllus fasciatus), N. H. SWELLENGREBEL (*Arch. Schiffs u. Tropen Hyg., 16 (1912), No. 6, pp. 169–182, figs. 4*).—The author's studies are presented under the following headings: Distribution of fleas in the docks and other parts of Amsterdam, feeding experiments with the blood of man and the rat, longevity of unfed fleas, destruction of fleas, and personal prophylaxis.

Discussion on the spread of plague, C. J. MARTIN (*Brit. Med. Jour., 1911, No. 2654, pp. 1249–1261, figs. 7*).—Accounts are given of the transmission of plague by fleas, including a report of cage experiments; experiments in specially constructed brick animal houses from which fleas could be practically excluded; the fate of the plague bacillus in the body of the rat flea, and the mechanism by means of which the flea infects a healthy animal; the approximate proportion of fleas in the stomachs wherein multiplication of bacilli takes place; and similar topics.

An attack of Hylesinus piniperda and H. minor in upper Dalarna, Sweden, T. LAGERBERG (*Skogsvårdsför, Tidskr., 1911 Almänna Delen, No. 11, pp. 381–395, figs. 7*).—An illustrated account of the injury caused by these scolytids, including a bibliography of 12 titles.

The southern pine beetle and its control, W. E. HINDS (*Alabama Col. Sta. Circ. 15, pp. 43–58, figs. 4*).—This circular embodies most of the information relating to *Dendroctonus frontalis* given in Farmers' Bulletin 476 (E. S. R., 26, p. 476), together with other data. This pest is causing the death of pine trees of various species in increasing numbers, in Alabama.

The movement of the Mexican cotton boll weevil in 1911, W. D. HUNTER (*U. S. Dept. Agr., Bur. Ent. Circ. 146, pp. 4, fig. 1*).—During the season of 1911 the boll weevil was greatly reduced in numbers throughout its entire range, as the result of a combination of climatic influences extending over a period of about 3 years. So unfavorable were the conditions that the insect was exterminated in an area covering about 23,000 square miles in the northwestern portion of Texas and the western portion of Oklahoma.

Notwithstanding this great reduction in 1911, considerable advance was made to the East and North when the dispersion movement began in August. As a result of this extensive dispersion much of the territory it had lost in Texas and Oklahoma was regained, and Florida became invaded for the first time.

A map is given which shows the dispersion of the cotton boll weevil from 1892 to 1911.

The insect enemies of the cotton boll weevil, W. D. PIERCE, R. A. CUSHMAN, and C. E. HOOD (*U. S. Dept. Agr., Bur. Ent. Bul. 100, pp. 99, pls. 3, figs. 26*).—The authors' investigations are here presented in 3 parts, part 1 (pp. 12–39) dealing with the status of the cotton boll weevil and its enemies; part 2 (pp. 39–83) with the biological complex; and part 3 (pp. 83–96) with the economic application. A bibliography of 54 titles is appended.

The authors consider the control of the boll weevil by insect enemies to be sufficiently great to give it a high rank in the struggle against the pest. "A considerable portion of the insect control would not be accomplished by any other factor; hence it is by no means to be neglected. The number of species of insects attacking the developing stages is 49. The control in any given place consists of the combined work of several different species. Places having the largest number of controlling insects have the highest percentage of control. In many places insect control is considerably greater than climatic control or than any other class of factors. The average insect control is 20 per cent of all immature stages or two-fifths of the entire natural control.

"The cotton leaf-worm is a valuable enemy of the boll weevil when it defoliates the cotton after September 1, a date beyond which new squares can not be expected to mature. It kills many weevils by starvation, kills many others while consuming the squares, and finally forces a premature hibernation which is generally fatal.

"The amount of control due to the various factors at work in any given place should be increased if possible. Parasites can be introduced into new

fields. In order to prevent serious injury to cotton, the mortality of the weevil should be above 90 per cent. It has averaged over 57 per cent for 4 years and has reached almost 100 per cent several times. While climatic influences occasionally bring the control above 90 per cent, they can not be regulated or in any way directly utilized. . . .

"The parasites and predators which attack the boll weevil are native insects, already present in a given territory before the weevil arrives. . . . The weeds surrounding the cotton fields contain many weevils which are harboring multitudes of available parasites. These parasites may be induced to attack the boll weevil by the timely elimination of their native hosts. This leads to the recommendation that planters cut the weeds adjoining the cotton fields, along the roadsides, turn rows, and fences about the time of the maturing of the crop. It also leads to the recommendation that a field adjoining the cotton be used as a pasture or hay field, and that this field be mowed early in the fall. The usual haying will also bring about the same result—namely, the elimination of other plants harboring weevils which attract the parasites needed in the cotton patch. . . .

"The cultural methods of controlling the cotton boll weevil are the most favorable methods of cotton culture from the parasitic standpoint. . . . The fact that many more parasites are reared in hanging squares than in fallen squares makes it desirable in humid regions to have many of the hanging squares in a field in order to serve as a nursery of parasites for the weevils in and fallen squares. . . .

"Any step which will diminish the number of weevils and not diminish the number of parasites in a field will of course increase the percentage of parasites present. The most important step of this kind is the collection of infested squares and placing them in cages with a screen through which the weevils can not escape but the parasites can. Ant colonies may be introduced into the fields in boxes of fresh manure."

A weevil (Æsiotes leucurus) destructive to pine trees (Pinus halepensis), W. W. Froggatt (*Agr. Gaz. N. S. Wales, 23 (1912), No. 1, pp. 55, 56, pl. 1*).—It is stated that this weevil is destroying every pine tree in an avenue in the neighborhood of Strathfield.

Historical notes on the causes of bee diseases, E. F. Phillips and G. F. White (*U. S. Dept. Agr., Bur. Ent. Bul. 98, pp. 96*).—This bulletin reviews papers relating to the etiology of bee diseases, in chronological order. The purpose of the bulletin is to assist bee keepers in obtaining a proper understanding of the work done by the various investigators.

Descriptions of two new genera and six new species of parasitic Hymenoptera, A. B. Gahan (*Proc. Ent. Soc. Wash., 14 (1912), No. 1, pp. 2–8*).—The new species here described include *Allorhogas gallicola* n. g. and n. sp., reared from cynipid twig galls on *Quercus pinifolia* from which the moth *Synanthedon scitula* was reared and on which it is thought to be parasitic; *Synaldis incisa* n. sp., taken from cages in which the Hessian fly was being reared and on which it is possibly parasitic; *Ditropinotus flavicoxus* n. sp., taken from a room in which quantities of insect-infested meal and other ground feed was stored; *Agromyzaphagus detrimentosus* n. g. and n. sp., reared from the puparia of an agromyzid fly, probably *Leucopis nigricornis;* and *Hoplogryon kansasensis* n. sp., taken from a cage in which experiments with the Hessian fly were being carried on.

The cotton leaf blister mite in Barbados (*Agr. News [Barbados], 11 (1912), Nos. 258, p. 90; 259, p. 106*).—It is stated that *Eriophyes gossypii*, first discovered in Barbados on February 27, 1912, infests an area which includes a strip some 2 or 3 miles wide along the westward coast for a distance of 18

miles, the southern limit apparently being about 4 miles southeast of Bridgetown. A committee has been appointed by the government of the island to investigate and report upon the steps that should be taken to stamp out the pest.

Insecticides: Mixtures and recipes for use against insects in the field, the orchard, the garden, and the house, H. MAXWELL-LEFROY (*Agr. Research Inst. Pusa [India] Bul. 23, 1911, pp. 22, pls. 11*).—A popular account including illustrations of spraying apparatus and of the author's mosquito trap.

FOODS—HUMAN NUTRITION.

The bacteriology of eggs and egg products with special reference to Bacillus coli, O. MAURER (*Kansas Sta. Bul. 180, pp. 333–344*).—Eggs were examined for the presence of *B. coli*, the work being undertaken as a part of a study of the economic aspects of the egg industry and particularly with reference to the deterioration of frozen and desiccated eggs.

Sixty fresh clean eggs from 30 different hens, the eggs being collected twice a day from trap nests, 50 eggs obtained from local farms, and 25 dirty eggs obtained from a packing house were used. "These [dirty] eggs were at least 3 weeks old, and were fairly covered with droppings." The colon bacilli were absent from the contents of all the eggs studied and from the shells of about 77 per cent of the clean eggs, and from 82 per cent of the farm eggs, but were found on the shells of all of the dirty eggs.

Experiments were made under a variety of conditions, including low temperature, with eggs smeared with feces (fecal bacteria) and egg and with a suspension of *B. prodigiosus*. In general, the results indicated that the microorganisms under consideration did not penetrate the unbroken shells of the eggs.

Experiments also showed that concentrated egg albumin did not exercise any bactericidal action upon *B. coli*, a result in harmony with that of other investigators. "Indeed, the presence of large numbers of colon bacilli in frozen and desiccated eggs would be impossible if the egg possessed bactericidal properties for this organism.

"It seems, therefore, that the only explanation we can give for the absence of *B. coli* from fresh eggs and from the oviduct is the lymphoid structure of the mucosa of the oviduct. This probably causes the removal, by leucocytic activity, of colon bacilli which have reached the oviduct, together with other intestinal organisms."

In general, the author concludes that fecal matter, which owing to the way they are handled comes in contact with the egg contents when they are broken and the yolk and white separated, is the source of the large number of colon bacilli often present in egg preparations.

"The bacterial content of canned eggs may be greatly reduced by separating only clean eggs. All soiled eggs which either directly or indirectly might give rise to fecal contamination of the egg meat should be utilized without separating the white from the yolk.

"[In preparing such egg products] the girls who break the eggs should wash their hands whenever they come in contact with the contents of bad eggs or with other contaminating material. The wash water should be used only once; indeed, a pail with water in which the girls frequently wash their hands makes matters worse. The cups into which the eggs are broken, and all other utensils that come in contact with the egg meat, should be washed in clean water whenever touched by contaminating material. These should not have any crevices, corners, etc., where material may accumulate, but should be as

smooth as possible. Glass cups are best. Live steam should be applied liberally to sterilize utensils, etc.

"The room in which the eggs are broken should be as cool as it can possibly be kept without making the inmates uncomfortable. The cleaner the room and everything in it, the fewer bacteria the product prepared in it will contain. The egg meat should be transferred to the freezing room as soon as possible."

A discussion of the healthfulness of frozen and desiccated eggs and of the need and value of bacteriological methods of judging them, O. MAURER (*Kansas Sta. Bul. 180, pp. 345-359*).—In connection with a summary of data regarding the bacterial contamination of egg products, experiments were made on the effects of heating such eggs for varying periods of time to 65, 70, and 75° C., in a water-jacketed oven.

When samples were heated to 75° the solubility of the goods was rapidly decreased.

With regard to wholesomeness, the author concludes that "in the absence of physical signs of decomposition, there is no danger of poisonings or bacterial infections through egg products.

"Bacteriological methods for judging the healthfulness of egg preparations are unnecessary and inapplicable.

"The sanitary conditions under which frozen and desiccated eggs are produced can not be judged by our present bacteriological methods, because the bacterial content of egg preparations is subject to great seasonal and local variations.

"Factory inspection should enforce sanitary methods of production and should exclude from the frozen and desiccated products all eggs that are not admitted to the market in the shell. . . .

"The bacterial content of desiccated eggs can, by keeping them for from 1 to 2 hours at 65 to 70°, be greatly reduced without decreasing their solubility very much. Practical tests will have to decide whether the advantages derived from the lower bacterial content would counterbalance the disadvantages arising from the somewhat lower solubility."

Besides desiccated eggs designed for food similar goods are made for trade purposes.

"In the manufacture of tanners' eggs, the sound portion of spot-eggs, eggs showing blood rings, and slightly off-flavored eggs are used. After desiccation, this product can hardly be distinguished, by its physical appearance, from first-grade eggs. When one sees and tastes this product, it seems a needless waste that it should be excluded from human consumption. Perhaps future researches will show us that a good many eggs which are now prepared for tanners are perfectly healthful and fit for human consumption. . . .

"All eggs that are really unfit for food, however, should be denaturized, to prevent unscrupulous people from selling them for food purposes. . . . After such eggs are sold to the tanners, it is very hard to keep track of them, and they may in a roundabout way make their appearance in cheap restaurants, etc. Denaturization of such preparations is the only sure way to prevent their use as food products. It would easily be possible to find a substance which, when added to tanners' eggs, would serve as a telltale without exerting a deleterious effect upon the leather."

Proper handling of dressed poultry, MARY E. PENNINGTON (*Butcher's Advocate, 52 (1912), No. 22, pp. 11, 12, dgms. 4*).—This article includes a description of the refrigerating plant used in connection with the work of the U. S. Department of Agriculture (E. S. R., 25, p. 579) in a laboratory devoted to the problem of handling poultry, a description of the temperature variations in

refrigerator cars, methods of packing and shipping poultry, and the changes likely to affect the birds during transportation.

Bacterial purification of oysters by floating in filtered artificial sea water, FABRE-DOMERGUE (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 6, pp. 393–395*).—A description of tanks for floating oysters. Artificial sea water is passed through the tanks in which the oysters are placed, pumped through a filter, and again passed into the tanks. In the opinion of the author the results are practically the same as those with natural sea water.

Floating oysters in filtered artificial sea water, E. BODIN (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 7, pp. 446, 447*).—An account of tests made with oysters floated in tanks similar to those described in the above article.

Oysters may be floated in such tanks for a month without losing their vitality or good appearance. Slight changes in flavor may take place after one week. As a method of bacterial purification, the method is considered as satisfactory as floating in natural sea water.

Cheese and its economical uses in the diet, C. F. LANGWORTHY and CAROLINE L. HUNT (*U. S. Dept. Agr., Farmers' Bul. 487, pp. 40*).—This popular summary includes data regarding cheese making, the care of cheese in the home, and the flavor of cheese, describes the kinds of cheese used in American homes, and discusses the food value of cheese, its composition, nutritive value and cost as compared with other foods, its digestibility, its use in the diet, and the making of bills of fare with cheese as the central food.

Directions are given for preparing homemade cheeses and a large number of cheese dishes of different sorts, which have been studied experimentally.

The widespread belief that cheese is not thoroughly digested and that it is often a cause of physiological disturbance is not substantiated by the experimental data summarized in this bulletin.

As a whole, the bulletin calls attention to the high nutritive value of cheese and the possibility of using it in many ways.

Kafir corn flour bread, C. DILLON (*Northwest. Miller, 90 (1912), No. 2, pp. 79, 80, figs. 4*).—A description of baking tests made by students of the Kansas Agricultural College in 1911. Various recipes for breads, cakes, etc., were studied experimentally, white durra flour, black-hull Kafir flour, white durra meal, and black-hull Kafir meal being tested.

The only difference noted between the white and the black-hull flours, or the corresponding meals, was the darker color of the black-hull products. In bread making it was found that these meals and white flour 1:1, 1:2, or 2:1 all made fairly satisfactory loaves, though a mixture containing the highest proportions of white flour made the lightest bread.

"The meal makes a good substitute for corn meal, as it can be used in practically every case that corn meal is used. When the meal is used alone, more liquid is required to mix it, and it lacks sufficient gluten to hold together. It also is rather harsh and flat tasting when used by itself, but when mixed with wheat flour the flavor is pleasant. The wheat flour also supplies the gluten, which makes its use much more successful. In most cases a mixture of two of meal to one of flour is good and in nearly all cases a mixture of 'half and half' is successful."

Coffee and coffee substitutes (*Quart. Bul. Bd. Health N. H., 1 (1912), No. 1–2, p. 3*).—Analyses are reported of various coffee mixtures and coffee substitutes.

"Incidentally it is of interest to note the difference between the now well-known non-coffee containing coffee substitutes and the newer coffee-cereal mixtures, in that, whereas the former consist mainly or wholly of bran, worth in most cases not over 3 or 4 cts. a pound at the most, the cereal or leguminous

portion of the latter is apt to represent the whole berry, rather than mere refuse."

Food analyses No. XXXVII, H. P. Cady and Jackson (*Bul. Kans. Bd. Health, 8 (1912), No. 3, pp. 53-63*).—Analyses of miscellaneous food materials are reported.

[Food inspection and other pure food and drug topics], E. F. Ladd and Alma K. Johnson (*North Dakota Sta. Spec. Bul., 2 (1912), No. 1, pp. 16, fig. 1*).—Chemical preservatives, coal-tar dyes, and other questions are considered and data reported regarding the examination of miscellaneous food products.

A paper by R. E. Remington on the protein content of vinegar gives analyses of vinegars, malt vinegars, and sugar vinegar, and a determination of protein in fresh juice expressed from Jonathan apples. The filtered apple juice, preserved for several weeks, yielded 0.007 per cent nitrogen, corresponding to 0.044 per cent protein. The analytical data are discussed with reference to vinegar standards.

If further work should confirm the authors' report, "and the protein content in nonsugar solids in cider vinegar be found to lie within comparatively narrow limits, i. e., 0.8 per cent to 1.5 per cent, this determination will furnish a simple means of detecting adulteration of cider vinegar with grain or molasses vinegar, on the one hand by high protein content, and with distilled vinegar on the other by low protein content."

L. A. Congdon reports a study of the coating and polishing of rice. His conclusions follow:

"The principal reason that rice is coated is for covering up poorer grade and quality.

"Rice is said to be prepared commercially by a polishing process, in which glucose, 1/1,000, and talc, 1/3,000 part of the whole, are added. Paraffin and rice starch are sometimes used in place of glucose and talc.

"Rice may be said to be coated with talc, glucose, and rice starch if the percentage of solids in the washings of the rice is above 1 per cent, and the percentage of ash in washings is above 1/10 of a per cent.

"Rice may be said to be coated with glucose and rice starch if the percentage of solids in the washings of the rice is above 1 per cent, and the percentage of ash in the washings is below 1/10 of a per cent.

"Rice may be said to be uncoated or not polished to any degree if the percentage of solids is below 1 per cent in the washings, and the percentage of ash in the washings is below 1/10 of a per cent; provided the rice has been tested for a coating of paraffin. Paraffin was found in 1 sample to the amount of 0.260 per cent."

[Food inspection and other pure food and drug topics], E. F. Ladd and Alma K. Johnson (*North Dakota Sta. Spec. Bul., 1 (1911), No. 39, pp. 453–468, figs. 2*).—Results of the examination of a number of samples of miscellaneous food products, beverages, and sugar beets are reported, and various food topics discussed.

Twenty-sixth annual report of the Ohio Dairy and Food Commissioner, S. E. Strode (*Ann. Rpt. Ohio Dairy and Food Comr., 26 (1911), pp. 117, pls. 3*).—A report of legislation, recommendations, prosecutions, inspections, analyses of miscellaneous food products, and similar data.

[A summary of the work of the food and dairy commission for the year ending June 30, 1911] (*Ann. Rpt. Food and Dairy Comr. S. Dak., 11 (1911), pp. 117*).—Inspections, prosecutions, and analyses made are reported and a summary of the publications of the commission included.

Laws of Massachusetts pertaining to the business of slaughtering (*Boston: State Bd. Health, 1911, pp. 12*).—A summary of the laws regulating slaughtering in Massachusetts, with special reference to the changes required by the acts of 1911.

The progress of international commerce in perishable foodstuffs, H. Hitier (*Ann. Géogr., 21 (1912), No. 116, pp. 109–117*).—A summary of the development of commerce in perishable goods, with special reference to conditions on the continent of Europe.

Gas and electric cooking (*Jour. Gas Lighting, 118 (1912), No. 2551, pp. 17, 18*).—An account of tests made in England.

The initial cost of an electric cooker and installation is reckoned as 75 per cent more than that of a gas cooker. Comparative tests were made of the cost of boiling water and baking sirloin of beef, cakes, etc. In all cases the cost of fuel was found to be greater with the electric cooker than with gas. In the sirloin of beef the loss by evaporation was 13 per cent with the electric, and 16 per cent with the gas, cooker. In boiling 1 qt. water it was found that the electric cooker required 12 minutes longer than the gas ring, and that the electricity required cost 0.5 ct. more than the gas.

A gas cooker of novel construction (*Jour. Gas Lighting, 117 (1912), No. 2550, pp. 870, 871, figs. 4*).—The oven here described is built with 2 metal walls with an air space between, the gas heating the air in the latter. It is claimed that as there is no gas burning in the oven spurting fat will not come in contact with the flames and cause a disagreeable smell, and that since the oven is enclosed the loss through evaporation during cooking will be less than in the ordinary oven. Temperature and cooking tests are given which, according to the author, indicate the economy of a cooker of this description.

The conditions of nourishment of pupils in Munich public schools, K. Oppenheimer and W. Landauer (*München. Med. Wchnschr., 58 (1911), No. 42, pp. 2218–2220; 59 (1912), No. 13, pp. 705, 706, dgm. 1*).—The first of these articles reports a study of the physical condition of school children in 2 public schools in Munich, one in a district populated mainly by day laborers, and the other in a district including some families in more easy circumstances. Age, general condition, weight, height, chest, and upper arm measurements were noted, and the relation between height and body weight of each child was calculated. Comparing the figures thus obtained with those commonly accepted as standard for children of various ages, the authors found that the children in both the schools investigated, but notably in that in the poorer section of the city, were on the average decidedly below normal.

The second article is an answer to criticisms called out by the deductions that the children here studied were necessarily undernourished. The authors suggest the distinction between quantitative and qualitative undernourishment and discuss the most satisfactory means of determining general physical development from physical measurements and similar topics.

Second experimental march to investigate the amount of food required by men on active service (*Jour. Roy. Army Med. Corps, 17 (1911), No. 6, pp. 629–643*).—The march here reported was made in August, 1910. It lasted 13 days, included men and officers, and was in every way comparable with the previous march (E. S. R., 25, p. 266). The men returned to the same camp each night. Physical measurements were taken every morning under conditions as nearly uniform as possible. The weather conditions were hardly better than during the first march, while the character of the roads was worse.

The ration was varied somewhat from that of the first march, bacon and cheese being substituted for part of the meat in different quantities during dif-

ferent periods of the march. The ration of jam was increased and pickles were added, but this latter addition was not appreciated by the men. The total ration provided 142 gm. of protein per man per day during the first week, and 175 gm. during the second week of the march. The average energy supplied was 4,511 calories per man per day. The total muscular work, external and internal, was calculated as 3,989 calories per man per day, an amount practically identical with that noted during the previous march.

The weight curves show an average gain during the first few days, next a slight fall, followed by a second gain, and a second smaller fall. Instead of an average loss such as appeared during the previous year, there was an average gain of 0.16 kg. in the weight of the men at the end of the march. They showed no symptoms of underfeeding, as in the previous case, and considered their diet in every way adequate.

In the opinion of the committee, a ration furnishing 4,500 calories of energy per man per day, and containing a larger proportion of fat and sugar than that found in the present ration, should be adopted by the British Army.

It is stated that the nitrogen balance of 2 of the officers during the second experimental march will be published later.

The disappearance of beri-beri from the Philippine (native) scouts, W. P. CHAMBERLAIN (*Military Surg., 28 (1911), No. 5, pp. 509–522*).—During the year 1910 changes were made in the rations for Philippine scouts which slightly preceded the change which was effected in the general Philippine ration. This preliminary change did not substitute unpolished for polished rice, but reduced the amount of polished rice, substituting for it legumes, ginger root, and various native vegetables. Aside from the change in the diet, conditions among the Philippine scouts remained practically the same as those in other native troops.

The health sheet of the scouts showed no remarkable changes except the disappearance of beri-beri. The Board for the Study of Tropical Diseases as They Exist in the Philippine Islands, which suggested the change, believes that the disappearance of the disease is due to the substitution of other vegetables for part of the polished rice. It does not hold that this contradicts the polished rice theory of beri-beri, but rather that it supports it, the substitution of vegetables for part of the polished rice in its opinion furnishing necessary mineral matters lacking in the polished rice.

Report of the U. S. Army Board for the Study of Tropical Diseases as They Exist in the Philippine Islands, W. P. CHAMBERLAIN, H. D. BLOOMBERGH, and E. B. VEDDER (*Military Surg., 28 (1911), No. 4, pp. 445–452*).—Data are summarized regarding the disappearance of beri-beri from the native Philippine scouts which followed a change in ration. The preparation of rice of different sorts is discussed and some data presented regarding the experimental work with poultry on rice in relation to the development of polyneuritis.

The influence of fat in the food upon the body fat of carp, J. KÖNIG, A. THIENEMANN, and R. LIMPRICH (*Ztschr. Untersuch. Nahr. u. Genussmtl., 23 (1912), No. 5, pp. 177–197*).—Among the conclusions drawn as the result of these investigations were that feeds with a high fat content produced a high fat content in the flesh of fish. Phytosterin was not detected in the body fat. The nature of the food fat or its cleavage products affected the taste of the fish, and in certain cases it became unpalatable. Analyses of the experimental animals and of several other species of fish are reported.

The condition of the liver as influenced by various kinds of food fats, S. S. CHALATOW (*Arch. Path. Anat. u. Physiol. [Virchow]. 207 (1912), No. 3, pp. 452–469*).—The author fed rabbits and white rats on diets consisting in different instances of sunflower seed oil, beef tallow, liver fat, ox brain, and

egg yolk, the experiment being continued for periods of several months each.

The most common phenomena which occurred in all of the experiments was that in the first period after the beginning of the feeding the liver of the animals became filled with greater or less quantities of fatty substances. With continued feeding of the same materials the fat masses in the liver not only did not increase, but, on the contrary, became gradually smaller and finally disappeared entirely.

The various fats did not produce the same effects in the animals. Whereas, according to the author, the liver disposed of sunflower seed oil, liver fat, and beef tallow with considerable ease, and feeding these substances produced no serious changes in the liver, feeding with egg yolk and ox brain brought about, in all cases, noticeable and generally similar pathological changes in the liver, which increased as the feeding periods lengthened. From this it may be concluded that these changes were not conditioned by the fats, but rather by the lipoid substances (probably those of the lecithin group) which in such cases were filtrated into the liver cells, together with the neutral fat, and frequently surpassed the latter in amount.

The effect of the different fats was not the same on rabbits as on rats. This difference in the behavior of the 2 species as regards the lipoid substances can, the author believes, be attributed to the fact that certain anatomical peculiarities of the rabbits produced certain not yet understood fermentations under the influence of which toxic modifications are produced out of the lipoid substances. In general, the changes produced when rats were fed with egg yolk were similar to those taking place in rabbits fed with sunflower oil, liver fat, and beef tallow.

Lecithin and its significance, J. Nerking (*Internat. Beitr. Path. u. Ther. Ernährungsstör. Stoffw. u. Verdauungskrank., 3 (1912), No. 4, pp. 455–461*).—This article is a summary of the theories regarding the rôle of lecithin in nutrition and its therapeutic use. The author concludes that for the latter chemically pure lecithin is necessary, but that most of the preparations commercially obtainable are of this character.

The respiration calorimeter—application to the study of problems of vegetable physiology, C. F. Langworthy and R. D. Milner (*U. S. Dept. Agr., Office Expt. Stas. Circ. 116, pp. 3*).—A brief description is given of the large calorimeter used for experiments with man and of a new respiration calorimeter of smaller size suitable for experiments with fruits and similar products which has recently been installed. Reference is also made to a microcalorimeter for use in the experimental study of very small quantities.

Recording and controlling devices of special construction involving much that is new and original have been used in the construction of the respiration calorimeter designed for the study of vegetable problems, so that the instrument will be very largely automatic in operation and can be operated at the same time and by the same observers as are employed upon experiments with man in the large calorimeter.

The work which has been done thus far with ripening fruit has demonstrated that the respiration calorimeter is fully as well suited to the study of certain fundamental problems of plant life as to the study of similar problems of animal life.

The apparatus can also be used, it seems safe to conclude, in studying such problems as the changes which take place when meat or cheese or other similar products are cured or ripened, and factors which influence these changes; that is, problems which are of commercial interest as well as of agricultural, domestic, and scientific importance.

ANIMAL PRODUCTION.

[Nutrition investigations]. H. L. RUSSELL (*Wisconsin Sta. Bul. 218, pp. 4–10, figs. 4*).—A brief report of work in progress at the station on the efficiency of rations from single plant sources, studies in protein nutrition, mineral requirements of farm animals, grain mixtures for feeding show sheep, and soilage versus silage for dairy cows.

Analyses of fodder plants, grasses, ensilages, etc., J. C. BRÜNNICH (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1910–11, pp. 56, 57*).—Analyses are reported of white panicum (*Panicum frumentaccum*), common panicum (*P. germanicum*), *P. bulbosum*, summer grass (*P. sanguinale*), Japanese millet, blady grass (*Imperata arundinacia*), blue grass (*Andropogon sericeus*), scented blue grass, 3 varieties of *Vigna catjang* (mammoth, purple and black cowpea), tall oat grass (*Anthistiria avenacea*), American grass (*Tripsacum dactyloides*), lab lab bean (*Dolichos lab lab*), sorghum, native vetch, red Natal grass (*Tricholæna teneriffæ*), lucern, and *Lotus australis*.

The use of ensilage (*Bul. Off. Gouvt. Gén. Algérie, 1911, No. 15, Sup., pp. 251–315, figs. 14*).—This discusses the different types of silos, and methods of growing silage crops and feeding silage, with special reference to Algerian conditions.

The large sunflower and sunflower cake, J. H. PAPAIOANNOU (*Ann. Gembloux, 22 (1912), Nos. 2, pp. 74–101; 4, pp. 209–234, pls. 2*).—A review of experiments relating to growing and utilizing the sunflower and its by-products as a feeding stuff, including the methods of growing the plant and feeding it. Analyses of the stem, leaves, head, seed, and cake, and samples of rations containing sunflower cake are given.

[Analyses of feeding stuffs], A. P. SANDLES (*Ann. Rpt. Ohio Bd. Agr., 65 (1910), pp. 441–512*).—This is the official report of feeding-stuff inspection during the year 1910. The analyses reported include cotton-seed meal, linseed meal, gluten feed, malt sprouts, hominy feed, distillers' and brewers' dried grains, tankage, beef scrap, and proprietary mixed feeds.

Stock feed: Bran, shorts, chop feed, A. MCGILL (*Lab. Inland Rev. Dept. Canada Bul. 231, 1912, pp. 41*).—Analyses are reported of bran, shorts, middlings, and mixed feeds.

Investigations on the stomach of ruminants, especially the Tragulidæ, E. SCHMIDT (*Arch. Naturgesch., 77 (1911), I, No. 2, pp. 1–40*).—A study of the comparative anatomy of the stomach of ruminants. Those of the species examined appeared to be on the same general plan. Hyæmoschus having the simplest and cattle the most complex type. The S-form of paunch in the embryonic calf is very similar to that of the mature paunch of the Tragulidæ.

A bibliography is appended.

The effect of alcohol on the movements of the paunch in ruminants, O. KNAUPP (*Klinische und Experimentelle Studien über die Wirkung des Spiritus auf die Mägen der Wiederkäuer. Inaug. Diss., Univ. Giessen, 1911, pp. 76, pl. 1, figs. 19*).—The frequency of the paunch movements in cattle, sheep, and goats was found to be dependent upon the nature of the food. The frequency and intensity was increased immediately after eating or after the administration of alcohol.

The significance of the pulse rate in vertebrate animals, FLORENCE BUCHANAN (*Ann. Rpt. Smithsn. Inst., 1910, pp. 487–505, figs. 3*).—The heart weight, pulse rate, and oxygen supply of wild and domesticated birds and mammals are given. The method of taking the pulse rate of small birds and mammals by means of a capillary electrometer is described, and the value of collecting such data is pointed out.

There was found to be a relatively larger heart in the more active animals, which means better staying power, as the longer diastole gives more time for recuperation. Small hearts and quick pulses are more characteristic of domesticated animals than of wild animals, except the race horse, as the most active individuals, because of their unruly nature, are often discarded for breeding purposes.

Contribution to the knowledge of the temperature of the skin of horses and cattle, R. SPOERL (*Beiträge zur Kenntnis der Hautwärme bei Pferd und Rind. Inaug. Diss., Univ. Giessen, 1911, pp. 49*).—Temperatures taken in different parts of the body under different conditions are presented in tabular form. In all cases the temperature of the skin was lower than the rectal temperature, and in all parts of the body was lower in cattle than in horses. The highest temperature was along the median line of the udder in cows, and near the heart and on the throat in horses. The lowest temperatures were at the extremities of the limbs.

Rôle of interstitial testicular cells, L. MAZZETTI (*Anat. Anz., 38 (1911), No. 14–15, pp. 361–387, figs. 14; abs. in Jour. Roy. Micros. Soc. [London], 1911, No. 6, p. 740*).—Interstitial cells from the frog, bird, dog, and man were found to be transformations of connective cells which proliferate between the tubules. They may also arise from lymphatic lacunæ. It is thought that they are of either no importance or possibly of some slight significance in connection with secondary sexual characters.

Biometric ideas and methods in biology; their significance and limitations, R. PEARL (*Scientia, 10 (1911), pp. 101–119; abs. in Zentbl. Allg. u. Expt. Biol., 2 (1912), No. 21–23, p. 546*).—The author sketches the rise and progress of biometry as a method of research in anthropology and biology, and shows that the real purpose of biology is quantitative treatment and does not imply any particular theory of heredity or variation. Its particular use lies in the fact that it solves the problem of describing the group in terms of its attributes and qualities, and not of individuals. Some of the limitations of the method and the errors that may arise in the improper use of biometric methods are pointed out.

Skull measurements in man and the hoofed mammals, H. F. OSBORN (*Science, n. ser., 35 (1912), No. 902, p. 596*).—The cephalic indexes and limb ratios are considered by the author to have the value of specific characters and, therefore, to be more significant than direct measurements in the study of comparative anatomy of hoofed animals. For example, in a cross between the horse and ass the cephalic indexes are found to be pure nonblending characters. Among the most significant indexes are the cephalic, the cranial, and the facial.

Breeding in the State of São Paulo, Brazil, L. MISSON (*L'Élevage dans L'État de São Paulo (Brésil). Govt. [1910?], pp. 90, figs. 58*).—A general statistical article, with special reference to pure-bred live stock.

Stock breeding in Kafa, Abyssinia, BIEBER (*Deut. Rundschau Geogr., 1911, No. 7; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 6, p. 1402*).—An outline of the live-stock situation.

The principal kinds of animals kept are zebus, fat-tailed sheep, horses, mules, and goats. The fowls are small and lay but few eggs, which are not eaten by the natives. Live stock methods are very primitive. Oxen are used only for plowing, horses for riding, and asses and mules as pack beasts. Milk is used chiefly for butter making. All kinds of live stock are cheap. Civets are also bred on a large scale, but only males are reared to any extent, as the females do not yield the product used in perfumery and tobacco factories.

The live-stock markets of London (*Breeders' Gaz., 61 (1912), No. 16, pp. 937, 938, figs. 6*).—An account of the English methods of marketing live stock

as seen at Islington and Deptford, as contrasted with customs in American live-stock markets. In 1911, 50,324 cattle were received at Islington, as compared with 223,600 in 1887, and the number of sheep 330,745, as compared with 877,870 in 1893. At Deptford the number of cattle arriving in 1911 was 66,877, a decline of about 5,000 from the previous year. It is thought that there will be a still further decline in both markets.

Reproduction and inheritance in race hygiene, M. von Gruber and E. Rüdin (*Fortpflanzung Vererbung Rassenhygiene. Munich, 1911, pp. 178, figs. 230*).—This contains photographs and detailed descriptions of the exhibits at the International Hygiene Exhibition held at Dresden, 1911, which illustrate reproduction, variability, selection, mutation, inheritance of acquired characters, laws of inheritance, Mendel's law, inheritance in man, degeneracy, race hygiene, and neomalthusianism.

A bibliography of about 1,000 titles on these topics is appended.

The Bakker-Dettweiler theory of the ancestry of the black and white cattle, H. Laessig (*Mitt. Deut. Landw. Gesell., 27 (1912), No. 2, pp. 21–24*).—The author believes that the conclusions of Bakker and Dettweiler (E. S. R., 26, p. 166), regarding the color of cattle at different times in the history of Holland are erroneous, because they are based largely on the colors of cattle in paintings. The Dutch painters were colorists, and consequently used color in many cases where it did not occur in nature.

On the origin and classification of our domesticated cattle, P. Holdefleiss (*Illus. Landw. Ztg., 31 (1911), No. 86, pp. 805–807*).—The author thinks that the introduction of black cattle from Jutland to Holland took place much earlier than stated by Dettweiler (E. S. R., 26, p. 166). In the study of relationships, it is thought that too much emphasis has been laid upon osteological differences, whereas pigmentation and other physiological properties have been minimized.

The origin and classification of our domesticated cattle, G. Laurer (*Illus. Landw. Ztg., 31 (1911), No. 91, pp. 850, 851*).—The author points out that pigmentation is of little diagnostic value because the different breeds can not be separated into spotted and shaded types as Holdefleiss indicates in the article noted above. The question of geographical distribution of breeds is also discussed.

The cattle of Friuli, E. Mascheroni (*Corriere Macelli, 2 (1911), No. 2, pp. 15–20; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 6, pp. 1403, 1404*).—A general and statistical article on the cattle industry in Friuli. Since 1878 the cattle have been much improved by crossing the native draft stock with the Simmental. There are about 250 cooperative creameries in the province, and 70,000 calves are exported annually. The methods of fattening cattle are described.

Returns at the Modena slaughterhouse, G. Squadrini (*Corriere Macelli, 2 (1911), No. 3, p. 32; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 6, pp. 1419, 1420*).—Data show that the Modena lowland breed of cattle is superior in net returns to the mountain breed, and also to other breeds slaughtered except the Bologna, Romagnole, and Friuli breeds.

The exportation of cattle, C. Robles and A. V. Hernández (*Econ. Mexicano, 52 (1911), No. 19, pp. 361–365*).—This contains statistics on the exports of cattle and hides from Mexico. From 1903 to 1910, inclusive, 983,899 head of cattle and 84,692 tons of hides were exported.

On the effects of castration and ovariotomy upon sheep, F. H. A. Marshall (*Proc. Roy. Soc. [London], Ser. B, 85 (1912), No. B 576, pp. 27–32*).—This

article discusses the differences in the horn growth of the various British breeds, and reports experiments with the Herdwick breed.

"The development of horns in the males of a breed of sheep in which well marked secondary sexual differentiation occurs (as manifested especially by presence or absence of horns) depends upon a stimulus arising in the testes, and this stimulus is essential, not merely for the initiation of the horn growth but for its continuance, the horns ceasing to grow whenever the testes are removed.

"The removal of the ovaries from young ewes belonging to such a breed does not lead to the development of definitely male characters, except possibly in an extremely minor degree."

The native sheep of Manche, G. GAUDOT (*Jour. Agr. Prat., n. ser., 23 (1912), No. 10, pp. 308, 309, pl. 1*).—The characteristics of the sheep in the department of Manche, and in particular the native breeds found in the region along the shores of the English Channel, are described.

The sheep of the Roman fields, B. BIANCHINI (*Gior. R. Soc. Naz. Vet., 59 (1910), Nos. 51, pp. 1218–1223; 52, pp. 1252–1256; 53, pp. 1265–1269; 60 (1911), Nos. 5, pp. 108–112; 6, pp. 123–127; 7, pp. 145–148; 8, pp. 175–179*).—A description of the types of sheep, both native and introduced, with a view to their improvement by better breeding and management.

Grazing farms, W. G. BROWN (*Queensland Agr. Jour., 28 (1912), No. 2, pp. 98–101*).—Estimates are given of expenditures and returns on a 20,000-acre sheep ranch in Queensland.

Iceland wool, A. E. INGRAM (*Daily Cons. and Trade Rpts. [U. S.], 15 (1912), No. 82, p. 89*).—This gives the amount and value of exports of Iceland wool to the United States and Great Britain, and recommendations for preparing and grading wool for export.

Algerian wool (*Bul. Off. Gouvt. Gén. Algérie, 1911, No. 14, Sup., pp. 207–247; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 7, pp. 1725, 1726*).—Statistical data on the wool production in Algeria since 1870 are reported.

A few observations on birth of goats, ALBRECHT (*München. Tierärztl. Wchnschr., 55 (1911), Nos. 29, pp. 481–485; 30, pp. 501–506*).—These articles report data on birth weight and after-birth weight, the relation of these weights to each other and to the weight of the mother, and the length of the parturition period.

A cage for metabolism experiments on goats, A. R. ROSE (*Biochem. Bul., 1 (1911), No. 2, pp. 222–226, pl. 1*).—This is a more detailed description of a contrivance previously noted (E. S. R., 26, p. 268).

Breeds of pigs suited for breeding on a small scale, SCHWARZ (*Arb. Landw. Kammer Pommern, 1911, No. 22, pp. 22; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 6, pp. 1410, 1411*).—This contains brief descriptions of breeds of pigs raised in Germany, with methods of feeding and breeding.

Chinese pork for export, R. S. GREENE ET AL. (*Daily Cons. and Trade Rpts. [U. S.], 15 (1912), No. 101, pp. 390–393*).—This consists of brief reports from several consulates.

The feeds commonly used to produce pork for export consist largely of by-products of the rice mills, soy-bean oil factories, breweries, and distilleries. The pork is stated to be of good quality and not more subject to disease than that produced elsewhere. Hankow is the center of the export trade in hogs, but it is stated that the finest pork comes from the province of Yunnan.

Monographs on the Belgian draft horse, H. DE THEULEGOET (*Monographie du Cheval de Trait Belge. Brussels, 1911, pp. 122, pls. 14*).—This contains the pedigrees and photographs of good types of Belgian draft horses. There is also a brief account of the origin of the domesticated horse, and particularly the origin of the breeds found in Belgium.

Origin of the Percheron horse, G. POWELL (*Farm and Ranch Rev., 7 (1911), Nos. 22, pp. 750–752; 23, pp. 792, 793*).—This is a translation of a chapter from a new book on the horse by G. Trolet.

Some early importations of noted horses to this province, J. RICHARDS (*Ann. Rpt. Dept. Agr. Prince Edward Island, 1911, pp. 79–87, fig. 1*).—These are notes on the importation of pure-bred horses to Prince Edward Island, begun with that of True Briton, a Suffolk Punch, imported in 1824.

Horse breeding in the time of Frederick William II, P. MARTELL (*Tierarzt. 51 (1912), No. 7, pp. 97–102*).—A historical note on horse breeding in Germany, with special reference to the efforts of Frederick William II to improve the character of horses used for military purposes.

Horse breeding in South Africa, W. G. RATTRAY (*Agr. Jour. Union So Africa, 3 (1912), No. 2, pp. 205–218*).—This contains some historical notes on the character of the horses in South Africa. It is advocated that more attention be paid to the breeding of horses in the future.

Kansas State Live Stock Registry Board: Report No. 2 (*Kansas Sta. Bul. 179, pp. 209–331, pls. 14*).—This contains portions of the text of the state law relating to the registration of stallions and a discussion of its benefits, fraudulent pedigrees, the status of the non-standard stallion, and similar topics. There are several popular articles on the breeding and management of horses written by different authors, and a list of stallions, licenses, and transfers for the year ended October 1, 1911.

Origin of the domestic dog, E. L. TROUESSART (*Compt. Rend. Acad. Sci. [Paris], 152 (1911), No. 13, pp. 909–913, figs. 2; abs. in Jour. Roy. Micros. Soc. [London], 1911, No. 6, p. 743*).—The author agrees with the suggestion of Jeitteles that the ancestor of domesticated dogs is to be found in the small Indian wolf (*Canis pallipes*), which has a well-marked supra-orbital crest. There is an exception, however, in the dog of ancient Egypt, recently discovered by Hilzheimer, Gaillard, and Lortet, and which seems to have been derived from several species of jackal. The author does not agree with Studer's conclusion that the domestic dog is descended from a European species which became extinct in the Quaternary period.

The poultryman's guide, compiled and edited by T. E. QUISENBERRY (*Mountain Grove, Mo. [1912], pp. 249, figs. 187*).—This work is issued by the Missouri State Poultry Board, and is a compilation of information gathered from many sources and covering all phases of the poultry industry.

Notes on the history of barred breeds of poultry, R. PEARL (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 22 (1912), No. 5, pp. 297–308, figs. 3*).—These notes relate to the origin of the Cuckoo Pekin bantam and the Barred Plymouth Rock. There is a discussion of the probability of the barring factor arising de novo. The data given suggest the possibility that in the early history of the Barred Plymouth Rocks the males were heterozygous as regards barring instead of homozygous as at present.

Campines in Belgium, England, and America, F. L. PLATT (*Rel. Poultry Jour., 19 (1912), No. 2, pp. 266, 267, 330–334, figs. 4*).—An account of the characteristics of the Campine and Braekel breeds of fowl, and of the origin of the Campine-Braekel crosses.

Increasing the egg yield by breeding, R. P. ELLIS (*Rel. Poultry Jour., 19 (1912), No. 2, pp. 263, 301–306*).—This contains the views of a practical poultry-

man, who shows why, in his opinion, it is not practical to breed the 200-egg fowl.

Bacteriological studies of newly laid eggs, O. MAURER (*Kansas Sta. Bul. 180, pp. 360–396, figs. 2*).—The object of these experiments was to determine the amount of infection in eggs and the factors influencing it during their formation. After some preliminary experiments to determine the number of bacteria in the egg, this work was given up and work limited to determine the number of eggs infected.

There was a tendency for the infected eggs to occur in small groups of 2, 3, or even 4, although there were cases where this tendency did not occur. No endeavor was made to express this tendency in more concise mathematical form, because only alternate eggs had been subjected to bacteriological examination, and because the number of eggs being laid outside the trap nests was quite large.

As the result of the experiments the following conclusions were drawn: "Eighteen and one-tenth per cent of the total number of eggs analyzed showed bacterial growth at room temperature, while only 8.3 per cent showed growth at blood temperature. Of the infected eggs, 82 per cent were infected in the yolk, 25.9 per cent in the white, and only 7.9 per cent in both white and yolk. The bacterial content of eggs undergoes great seasonal changes, generally increasing with the rise in temperature. No definite relation could be traced between the bacterial content of eggs and their hatching qualities. No relation could be found between the age of the fowls and the bacterial content of their eggs. No definite influence of the fattening ration upon the number of eggs infected and upon their hatching qualities could be observed."

A bibliography is appended.

The fertility of hen eggs, D. F. LAURIE (*Jour. Dept. Agr. So. Aust., 15 (1912), No. 7, p. 723*).—Most of the eggs were found to be fertile until 7 or 8 days after the cock was removed from the pen. None were fertile after 17 days.

Contributions to the artificial incubation of fowls, J. PAECHTNER (*Deut. Landw. Presse, 39 (1912), Nos. 12, pp. 126, 127; 13, pp. 139, 140, figs. 9*).—Tests made of an incubator, which is illustrated and described, are reported in detail.

How to raise chicks, P. T. WOODS (*Chicago, 1912, pp. 123, figs. 33*).—This book was written for the practical poultryman and covers the selecting, breeding, and management of fowls.

DAIRY FARMING—DAIRYING.

Practical lessons from the management of the university dairy herd, G. C. HUMPHREY and F. W. WOLL (*Wisconsin Sta. Bul. 217, pp. 3–34, figs. 4*).—This contains data on milk production of the dairy herd during the 2 years following the report previously noted (E. S. R., 22, p. 677).

The average record for 22 cows was 7,978.2 lbs. of milk and 352.51 lbs. of fat in 1909–10, and 8,536.3 lbs. of milk and 354.77 lbs. of fat in 1910–11. The value of the products for the 2 years was $121.71 and $114.41, respectively. The net profit per cow was reduced from $69.16 the first year to $48.69 the second year, due to the lower prices for dairy products and the higher prices for feed. Over 1 lb. of milk fat and 24 lbs. of milk were produced daily per cow during the winter months.

High protein rations were less economical than medium protein rations. It is recommended that some high protein roughage, as alfalfa and clover hay, be available on every dairy farm in order to reduce the cost of rations. During the first weeks of pasturage the cows gained in production but lost in weight,

but it is thought that this loss can be reduced to a minimum by feeding hay or silage during the first few weeks on pasture.

The individual records of the cows, schedule of prices for feed, and other data are presented in tabular form.

The Illawarra dairy cattle, CAMDEN (*Pastoralists' Rev., 21 (1912), No. 12, pp. 1254, 1255, figs. 5*).—An account of the methods of dairying in the Illawarra district of New South Wales.

There is also an account of the origin of a general purpose breed of cattle, known as the Illawarra, an association of which was formed in 1910. The requirement for registration is not pedigree, but in the case of cows is a record of performance. If a cow "has not more than 2 permanent teeth up she must yield at the rate of at least 8 lbs. of commercial butter per week. With more than 2 teeth, and not less than 4, she must give at least 9 lbs.; with 4 teeth and not more than 6 she must give 10 lbs.; and a cow with more than 6 permanent teeth must make at least 12 lbs. of commercial butter per week. . . . The standard for bulls shall be that 4 of their progeny have qualified for the herd book, and that they score not less than 75 per cent of points on the scale of points approved by the association."

The cattle of Touraine, J. B. MARTIN (*Bul. Mens. Off. Renseig. Agr. [Paris], 11 (1912), No. 2, pp. 197–211*).—This article discusses the breeds of cattle in Touraine, and gives records of the milk production and the work of the breeder's associations.

Bacteria as friends and foes of the dairy farmer, W. SADLER (*London, 1912, pp. XV+112, pls. 4*).—A small book on dairy bacteriology, written in a popular style for the producer and consumer of dairy products.

[Dairy investigations], H. L. RUSSELL (*Wisconsin Sta. Bul. 218, pp. 26–30, fig. 1*).—A brief report of progress at the station in making Cheddar cheese from pasteurized milk, the rôle of bacteria in ripening Cheddar cheese, manufacture of buttermilk cheese, the cause of mottles in butter, a new homogenizing device, improvement of the quality of the milk supply, and the distribution of dairy factories in Wisconsin.

Judging dairy products by points, M. A. O'CALLAGHAN (*Agr. Gaz. N. S. Wales, 23 (1912), No. 1, pp. 25–30*).—This contains the score cards used in teaching students to judge milk, fresh cream for table use, cream for butter making, butter, and cheese.

A synthetic milk medium, H. A. WHITTAKER (*Amer. Jour. Pub. Health, 2 (1912), No. 3, p. 162*).—A method for preparing an artificial milk for use as a standard medium for exact bacteriological determination is described as follows:

"Fifteen gm. of pure caseinogen are dissolved in 100 cc. of a 1 per cent solution of sodium hydroxid in distilled water. Eighteen to 24 hours may be required for a complete solution. After the caseinogen is dissolved the solution is diluted to about 900 cc. with distilled water. Ten gm. of lactose and 0.1 gm. of calcium chlorid are added and the solution made up to 1,000 cc. with distilled water. It is then neutralized and made +0.3 with N/1 hydrochloric acid, using phenolphthalein as an indicator. This medium is sterilized in an autoclave at 107° for 20 minutes. The finished product should be a clear, transparent solution. When the medium has a reaction of +0.3 about 24 hours are usually required for coagulation with an active strain of *Bacillus coli*. When the reaction is neutral a somewhat longer time may be required to produce similar results. This medium has been thoroughly tested on the routine test for *B. coli* and apparently meets all requirements."

The food value of clean milk.—The demand for clean milk: The reasonableness of it, R. M. WASHBURN (*Agr. of Mass., 58 (1910), pp. 47–63*).—It is

pointed out that milk has not been estimated by the consumer at its full value as a food. Many suggestions are given for the production of pure milk.

Ozone and the sterilization of milk, W. P. BLISS (*Jour. Meat and Milk Hyg., 1 (1911), Nos. 6, pp. 324–330; 7, pp. 400, 401; 9, pp. 505–508; Rev. Gén. Lait, 8 (1911), Nos. 22, pp. 505–515, fig. 1; 23, pp. 532–539; 24, pp. 553–559*).—Milk treated with ozone acquired an unpleasant taste, which could not be reduced except to a trifling extent by aeration. Ozone delayed curdling, and the length of time which elapsed between the curdling of the raw specimen and the ozonized milk increased roughly as the concentration increased. In general slow ozonization was of more value than fast ozonization.

Bacterial counts showed that ozone destroyed an appreciable number of the bacteria, on the average about 40 per cent, but too low a percentage to be considered efficient in preserving milk. The remaining bacteria are apt to grow faster than those in the untreated samples, so that although at first the numbers may be reduced 40 per cent, in 24 hours they may be as high as, or higher than, in the raw milk.

"The marked irregularity in the results of the experiments proves that the preservation of the milk depends upon the nature of the milk rather than the amount or concentration of the ozone, and that ozonization can not be depended upon to produce definite increase in this length of preservation."

The utilization of skim milk, C. KNOCH (*Die Magermilch-Verwertung in den Molkereien. Leipsic, 1912, 2. ed., rev. and enl., pp. IX+249, figs. 42*).—This book treats of the methods of testing skim milk, the economic significance of skim milk, and methods of manufacture into other products. The methods of using skim milk for making kefir, yoghourt, milk cognac, milk chocolate, margarin cheese, ziger, milk bread, diastasolin, and milk-molasses stock feeds are described. Details are given for manufacturing milk sugar, condensed milk, powdered milk, butterine, and many patented products such as galalith, casein cement, casein lime, casein plaster, an imitation of amber, shoe polish, plasmon, nutrose, sanatogen, casein soap, and material used for insulating.

Kefir and yoghourt, M. HOHENADEL (*Pharm. Zentralhalle, 52 (1911), Nos. 50, pp. 1337–1342; 51, pp. 1371–1378; 52, pp. 1401–1404*).—This article describes the methods of preparing kefir, yoghourt, and other fermented milks, and discusses their dietetic and therapeutic values.

Kefir (*Merck's Ann. Rpts., 24 (1910), pp. 39–63; Merck's Arch., 13 (1911), No. 12, pp. 389–395; 14 (1912), No. 1, pp. 14–18*).—This describes different methods of preparing kefir. A bibliography is appended.

The chemical composition of Mecklenburg butter in the years 1899–1903, and 1910–11, W. D. KOOPER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 23 (1912), No. 5, pp. 198–205*).—A large number of analyses showed that there were seasonal variations. Butter made in summer had a higher fat content and iodin number, and a lower Reichert-Meissl number and a smaller percentage of solids-not-fat, than winter butter.

Varieties of cheese, C. F. DOANE and H. W. LAWSON (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 146, pp. 78*).—This is a revision of a bulletin previously noted (E. S. R., 20, p. 181). A few additional varieties of cheese have been included.

The present position of the cheese ripening problem, O. JENSEN (*Centbl. Bakt. [etc.], 2. Abt., 32 (1912), No. 6–12, pp. 202–209; Molk. Ztg. Berlin, 22 (1912), Nos. 12, pp. 133, 134; 13, pp. 145, 146*).—This is a lecture given at the Fifth International Dairy Congress at Stockholm, and consists of a summary of investigations on the ripening of cheese.

The cheese of Forez and D'Ambert, ARDOUIN-DUMAZET (*Jour. Agr. Prat., n. ser., 21 (1911), No. 26, pp. 811–813*).—The typical cheeses made in the depart-

ment of Puy-de-Dôme, which are known as "fourmes du Forez et D'Ambert" are cylindrical in shape and 25 cm. long by 13 cm. in diameter. The dairy methods used in making these cheeses are extremely primitive. A peculiarity is the method of ripening, which is accomplished by placing the cheeses on the ground in a cellar and covering them with earth, over which spring water is allowed to flow. Molds develop in the earth causing many of the cheeses to deteriorate in quality and to become unfit for export. The inside cuts of the best cheeses have an appearance and taste quite similar to Roquefort, but are not so dry as Septmoncel and Sassenage made in the southwest of France.

Swiss cheese exports in 1910, L. von Hennet (*Mitt. Fachberichterstat. K. K. Ackerb. Min.* [*Vienna*], *1911, No. 7, pp. 54, 55; abs. in Internat. Inst. Agr.* [*Rome*], *Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 6, p. 1417*).—Statistical data on the exports of cheese, most of which is sent to France, the United States, and Germany. The exports to Italy have declined in the past few years owing to the development of dairying in northern Italy.

VETERINARY MEDICINE.

Immunity, J. Citron, trans. by A. L. Garbat (*Philadelphia, 1912, pp. XIII+209, pls. 2, figs. 27*).—This publication deals with the methods of diagnosis and therapy and their practical application, and considers chiefly the human aspect. Among its contents are the following: Laboratory equipment, active immunity, tuberculin diagnosis, tuberculin therapy, toxin and antitoxin, the toxins of the higher plants and animals and their antibodies, ferments and antiferments, agglutination, precipitins, bacteriolysins and hemolysins, method of complement fixation, technique of the complement fixation method, phagocytosis, opsonins and bacteriotropins, and passive immunity.

Immunity, protective vaccination, and serum-therapy, A. Dieudonné (*Immunität, Schutzimpfung und Serumtherapie. Leipsic, 1911, 7. ed., rev., pp. VII+243, figs. 5*).—This is the seventh revised edition of this work (E. S. R., 23, p. 481).

Experimental bacteriology and the infectious diseases, with particular regard to immunity, W. Kolle and H. Hetsch (*Die Experimentelle Bakteriologie und die Infektionskrankheiten, mit besonderer Berücksichtigung der Immunitätslehre. Berlin and Vienna, 1911, vol. 1, 3. ed., rev. and enl., pp. XVI+496, pls. 49, figs. 68*).—This is the first volume of the third revised and enlarged edition.

Experimental bacteriology and infectious diseases, W. Kolle and H. Hetsch (*Die Experimentelle Bakteriologie und die Infektionskrankheiten. Berlin and Vienna, 1911, vol. 2, 3. ed. enl., pp. VII+497–968, pls. 49, figs. 111*).—This is the second volume of this text-book, which deals with diphtheria, tuberculosis, botulism, ulcus molle, infections caused by the *Bacillus pyocyaneus*, hemorrhagic septicemia of animals, hog cholera, swine plague, swine erysipelas, diseases caused by spirochetes, syphilis, the most important morphological and biological characteristics of protozoa, amoebic dysentery, flagellate infections particularly trypanoses, coccidial diseases, malaria, piroplasmoses, rabies, foot-and-mouth disease, pox in man and animals, mold fungi and budding fungi, ankylostomiasis, trichinosis, filariosis, and critical remarks in regard to the etiology of some infectious diseases of which the cause has not been discovered. An appendix is included which deals with the cultivation of bacteria, the most important staining methods, and methods for fixing and imbedding tissue.

Manual of bacteriology, R. Muir and J. Ritchie (*London, 1910, 5. ed., pp. XXIII+688, pls. 6, figs. 174*).—This is the fifth edition of this well-known work, which has been brought up to date.

The yearly report of the progress made in the field of the pathogenic micro-organisms, edited by P. von Baumgarten and W. Dibbelt (*Jahresber. Path. Mikroorgan., 24 (1908), pp. XII+1136*).—This is a review of the literature issued in the year 1908 on bacteriology and protozoology.

Report of the fifteenth annual meeting of the United States Live Stock Sanitary Association (*Rpt. U. S. Live Stock Sanit. Assoc., 15 (1911), pp. 191*).—Among the more important papers presented in this report are the following: Bovine Tuberculosis, Its Problems and Control (pp. 51–56), by V. A. Moore; New Methods of Tuberculin Testing (pp. 56–62), by K. F. Meyer; Tuberculosis—Summary of Methods and Results to Date, with Suggestions (pp. 76–78), by A. D. Melvin; Dourine in Horses, Covering Investigations in Iowa (pp. 79–83), by A. W. Miller; The Cattle Fever Tick Proposition (pp. 106–111), by E. M. Nighbert; Infectious Abortion in Cows and Mares (pp. 114–120), by E. S. Good; Outline of Experimental Work on Infectious Abortion of Cattle (pp. 120, 121), by W. Giltner; Contagious Abortion of Cattle (pp. 121–123), by W. P. Larson; Treatment of Hog Cholera with Attenuated Virus (pp. 125, 126), by A. T. Peters; Researches on Hog Cholera (pp. 129–135), by M. Dorset; Hog Cholera—V. B. Vaccination (Virulent Blood) (pp. 135–140), by M. H. Reynolds; and Report on the Nomenclature of Swine Diseases (pp. 142, 143), by V. A. Moore et al.

The following papers are presented in the appendix: Serum Diagnosis of Glanders and Other Animal Diseases (pp. 165–172), by J. R. Mohler; Rabies (pp. 172–175), by S. W. Ward; Control of Glanders in Minnesota (pp. 175–178), by C. E. Cotton; The Probable Influence of the Open Water Trough in the Spread of Glanders (pp. 178–181), by A. T. Kinsley; Further Report on Arsenical Dips as Remedies for Cattle Ticks (pp. 181–186), by B. H. Ransom; and Experience in Eradicating Tuberculosis from a Herd (pp. 186–188), by N. S. Mayo.

Some of the features of sanitary police work as applied in the federal quarantine service, R. N. Hickman (*Amer. Vet. Rev., 40 (1912), Nos. 5, pp. 591–600; 6, pp. 748–756*).—A paper presented at the forty-eighth annual convention of the American Veterinary Medical Association, held at Toronto, August, 1911.

Clinical diagnostics of the internal diseases of domestic animals, B. Malkmus (*Chicago, 1912, 4. ed., pp. X+259, pl. 1, figs. 57*).—This is a translation by D. S. White and P. Fischer of the fourth revised and enlarged edition of the author's Grundriss der Klinischen Diagnostik.

The subject is taken up as follows: The diagnosis of diseases (pp. 11–17), anamnesis (pp. 18–20), method of examination (pp. 21–30), general part of the examination (pp. 31–74), special part of the examination (pp. 75–221), and specific examinations (pp. 221–251).

The animal parasites of cattle and wild animals recorded as occurring in the Belgian Kongo (*Bul. Agr. Congo Belge, 2 (1911), Nos. 1, pp. 116–120; 3, p. 427*).—This list, arranged by districts, records the locality and hosts of animal parasites of the Belgian Kongo.

The hydrocyanic acid content of three varieties of Andropogon, J. Schröder and H. Dammann (*Chem. Ztg., 35 (1911), No. 155, pp. 1436, 1437*).—The varieties here discussed are *A. sorghum saccharatum, A. sorghum vulgaris*, and *A. sorghum halepensis*. The experiments reported were carried on in Uruguay, following the loss of cattle which had been fed upon sorghum.

The plants were cut at different periods in their growth and chemical analyses made to determine the hydrocyanic acid content with the result that all 3 varieties were found to contain it during the growing period. The content diminished with the growth of the plant and none was found in the seeds.

The application of nitrate of soda was found in nearly all cases to increase the amount of hydrocyanic acid present. In drying the plants a part of it disappeared so that the straw contained less than the green plants.

Amount of hydrocyanic acid in sorghum at different periods of growth.

Date.	Height of plant (unfertilized).	Period of growth.	Hydrocyanic acid content.			Stage of cutting.
			In unfertilized plants.	In plants fertilized with nitrate of soda.	Increase through application of nitrogen.	
A. sorghum saccharatum.	*Cm.*	*Days.*	*Per cent.*	*Per cent.*	*Per cent.*	
Dec. 2, 1910	20	44	0.0293	0.0414	+0.0121	
Dec. 20, 1910	60	62	.0211	.0314	+ .0103	Dry.
Jan. 26, 1911	100	99	.0057	.0039	— .0018	Beginning to bloom.
Feb. 15, 1911	110	119	.0048	.0052	+ .0004	Blooming.
Mar. 3, 1911	120	135	.0013	.0044	+ .0027	Beginning to seed.
Mar. 24, 1911	120	156	.0028	.0048	+ .0020	Withering.
A. sorghum vulgaris.						
Dec. 2, 1910	40	44	.0192	.0366	+ .0174	
Dec. 20, 1910	60	62	.0176	.0243	+ .0067	Dry.
Jan. 30, 1911	100	103	.0065	.0071	+ .0006	Beginning to bloom.
Feb. 16, 1911	130	120	.0053	.0059	+ .0006	In full bloom.
Mar. 3, 1911	140	135	.0025	.0096	+ .0071	Beginning to seed.
Mar. 24, 1911	140	156	.0054	.0026	— .0028	Withering.
A. sorghum halepensis.						
Dec. 27, 1910	20	44	.0137	.0212	+ .0075	Dry.
Jan. 27, 1911	30	74	.0036	0052	+ .0016	Beginning to bloom.
Feb. 16, 1911	60	94	.0028	.0052	+ .0024	In full bloom.
Mar. 3, 1911	60	109	.0040	.0056	+ .0016	Beginning to seed.
Mar. 27, 1911	60	130	.0028	.....	.....	Ripe.
Dec. 25, 1910	40	.....	.0005	.....	.....	Plants in second year.
Dec. 25, 1910	.....	.....	.0003	.....	.....	Do.

The toxic effects of three varieties of Andropogon, J. SCHRÖDER and H. DAMMANN (*Agros, 2 (1911), No. 10, pp. 283–290*).—This paper relates to the studies of *Andropogon sorghum saccharatum*, *A. sorghum vulgaris*, and *A. sorghum halepensis*, as noted above.

Some studies on cotton-seed meal poisoning, C. W. EDGERTON and H. MORRIS (*Louisiana Stas. Bul. 134, pp. 3–35*).—This is a report of investigations, which have extended over a period of more than 2 years, from which the following conclusions are drawn:

"Cotton seed and cotton-seed meal does contain a toxic principle which is poisonous to certain animals. Cotton seed, itself, seems to be more toxic than the ordinary commercial cotton-seed meal. Different lots of cotton seed and cotton-seed meal show a considerable variation in toxicity.

"The toxicity of the cotton-seed meal does not seem to be affected by the fungi which rot the cotton bolls and enter the cotton seed. Cotton seed from plants affected with the cotton wilt, or black root disease, are less toxic than cotton seed from healthy plants. This decrease in toxicity in this seed is not due to the premature ripening of the seed, because seed ripened on plants that had been cut down showed as much toxicity as seed from healthy, uninjured plants.

"Heating cotton-seed meal or cotton-seed kernels for a long period at a high temperature decreases the toxicity to a considerable extent. A very short heating of the cotton-seed kernels, followed by an extraction of the oil, apparently does not decrease the toxicity. Another factor enters here, however,

which must be considered. This heated meal is much more palatable than the raw kernels and animals eat considerably more of it. Animals make better gains on this meal than on the kernels, though they die as soon, or even sooner, than animals on the raw kernels.

"The heating to which the kernels are subjected in the oil mill is probably sufficient in most cases to reduce the toxicity to some extent, though this reduction is usually not enough to remove all danger from feeding susceptible animals.

"The careful fermentation of the kernels or meal seems to reduce the toxicity to a considerable extent.

"All the cotton varieties that were tested that were grown on the same plat of ground during the same season, showed no difference in the toxicity.

"Sea Island seed obtained from Porto Rico was extremely toxic.

"We have no evidence whatever to show that pyrophosphoric acid has anything to do with cotton-seed meal poisoning."

Reference is made to the investigations of Crawford, previously noted (E. S. R., 22, p. 502).

On the action of Senecio alkaloids and the causation of hepatic cirrhosis in cattle, A. R. CUSHNY (*Proc. Roy. Soc. [London], Ser. B, 84 (1911), No. B 570, pp. 188–190*).—This is a preliminary report of experiments with the 2 alkaloids found in *Senecio latifolius*, made chiefly upon cats.

"The symptoms induced are of 2 kinds, acute, and subacute. The acute symptoms commence with nausea and salivation, extremely accelerated respiration, and, somewhat later, violent clonic convulsions under large doses. These acute symptoms generally pass off in the course of 2 or 3 hours, and the animal appears perfectly well very often for the next 2 or 3 days or longer. Some loss of weight may occur during this time, and then the subacute symptoms are introduced by a stool of rather loose consistency, loss of appetite, and in some cases vomiting. The animal then becomes weak and disinclined to move, and passes into a condition of apathy, stupor and coma, death following by failure of the respiration. These later symptoms succeed each other rapidly, death occurring within 24 to 48 hours after the first subacute symptoms. . . .

"Post-mortem appearances varied a good deal in different animals. There was often found an unusual amount of fluid in the abdominal cavity, sometimes of a bright yellow color. Small ecchymoses were sometimes found in the omentum, and fat deposits in the abdomen. The stomach contained black masses of half-digested blood, and the duodenum also contained some effused blood mixed with mucus. The liver was swollen and congested, and the gall bladder was generally distended with very dark colored viscous bile, which could only be expressed from it with difficulty. Small hemorrhages were often found in the lungs, pancreas, kidney, and some other organs. . . . In chronic poisoning no symptoms, except loss of weight, were elicited until the drug had been given for over a month. . . . The animal then died with the same appearances as in subacute poisoning. . . . The 2 alkaloids sent to me induced the same symptoms and the same changes, and seem to be equally toxic."

A study of the renal epithelium in various types of acute experimental nephritis and of the relation which exists between the epithelial changes and the total output of urine, W. DE B. MACNIDER (*Jour. Med. Research, 26 (1912), No. 1, pp. 79–126, pls. 4*).—"From the experimental data presented in this investigation the following conclusions appear allowable:

"Cantharidin, potassium dichromate, uranium nitrate, and sodium arsenate produce in the dog an acute nephritis in which both the vascular and the epithelial elements of the kidney are involved. The histological study shows that the vascular element of the kidney is first affected and that the rapidity

with which the epithelium is involved depends principally upon the nephrotoxic substances employed in producing the nephritis. Uranium nitrate and potassium dichromate usually produce a tubular nephritis much earlier than either cantharidin or sodium arsenate.

"In the early stages of the nephritis from these poisons, when there is anatomical evidence of vascular injury and either slight or no anatomical evidence of epithelial injury, the output of urine is increased. Later in the nephritis, when histologically the vascular pathology may not be increased in severity but when the epithelium has become involved, the output of urine is reduced or an anuria is established. Those nephrotoxic substances which have the most marked affinity for the tubular epithelium are the substances which most rapidly cause either a reduced output of urine or an anuria, while those nephrotoxic substances, such as arsenic, which cause an early and a pronounced vascular injury, with late epithelial involvement, are the poisons which have the least tendency to produce an anuria.

"In the experiments detailed in this study which have shown either a pronounced decrease in the output of urine or an anuria, there have constantly been associated epithelial changes, which would produce in different degrees an obstruction of the lumen of the tubules. In those experiments in which the output of urine has not been decreased, and in those experiments in which the output of urine was increased beyond the normal, such epithelial changes either did not exist or they were histologically slight."

The precipitation reaction for anthrax, HOBSTETTER (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 7, pp. 117–119, figs. 2*).—The chief difference between Ascoli's test (E. S. R., 26, p. 375) and Pfeiler's reaction lies in the fact that in the first named the precipitating reagent is prepared by heating the suspected material in a boiling water bath for a few minutes with physiological salt solution, and in the latter the material is rubbed up with chloroform and porcelain sand and extracted with carbolized salt solution. The latter method has the disadvantage of requiring about 7 hours for the preparation of the extract, but with the former the reaction is not so intense.

The diagnosis of anthrax by the Ascoli reaction, A. LEBRE (*Arch. R. Inst. Bact. Camara Pestana, 3 (1912), No. 3, pp. 379–397, figs. 7*).—This reaction (E. S. R., 26, p. 375) furnished very satisfactory results, even when the material to be tested was putrid.

Aggressin immunization against symptomatic anthrax, O. W. SCHÖBL (*Abs. in Science, n. scr., 35 (1912), No. 893, p. 237*).—"Briefly, the results of the experiments are as follows: The existence of aggressin in blackleg edema has been proved, since the sterile edema fluid aids infection by hindering the natural protective apparatus of the organism. Phagocytosis chiefly is inhibited. It is nontoxic even in much larger quantities than the amount necessary to change a sublethal dose of symptomatic anthrax bacilli into the lethal dose. Repeated injections of sterile edema fluid leads to a considerable degree of immunity. The animals are not only immune themselves, but also yield serum that protects normal animals from subsequent infection. Such a serum shows the presence of antibodies demonstrable both in vitro and in vivo, the most striking characteristic being its favorable effect upon the phenomenon of phagocytosis.

"In the subcutaneous circumscribed infiltration following artificial infection, immunized animals may under certain circumstances harbor virulent symptomatic anthrax bacilli. Therefore, the immunity can not be considered bacteriolytic. The immunity consists of a complete or partial inhibition of the growth of symptomatic anthrax bacilli in the body of the immunized animal. If the immunity is not sufficient to suppress completely the growth of bacilli, they multiply locally and are still able to produce toxin. The difference

between antitoxic and antiinfectious immunity is in the case of symptomatic anthrax quite evident. The fact frequently observed in the experiments that immune animals may harbor in their bodies symptomatic anthrax bacilli, fully virulent for normal animals, is worthy of consideration from an epidemiological standpoint.

"The method if immunization with aggressin is advantageous in that the inoculating material is a sterile fluid, hence the danger of making bacillus carriers or setting up a virulent infection through the vaccinating material is avoided."

Anthrax and tick fever, W. H. DALRYMPLE (*Amer. Vet. Rev., 40 (1912), No. 6, pp. 757–764*).—This is a continuation of the paper previously noted (E. S. R., 26, p. 678), and deals with Texas or splenetic fever, and the cattle tick and its eradication.

Vaccination against blackleg in Bavaria, T. KITT (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 9 (1911), No. 1–2, pp. 99–119*).—Vaccination against symtomatic anthrax has been carried on for the last 20 years in Bavaria. The vaccine used in most instances was prepared by heating with live steam the powdered muscle of animals affected with blackleg. A table is given taking in the years 1898 to 1909, inclusive, which gives the number of vaccinated and unvaccinated animals, and the mortality statistics in each case. The mortality in the case of the vaccinated animals was very low.

In addition to these some tests are reported in regard to the preparation of vaccine for blackleg free from living spores, and the author points out some of the disadvantages which are encountered in sterlizing vaccine according to the various methods.

The viability of human carcinoma in animals, C. L. WILLIAMS (*Proc. Roy. Soc. [London], Ser. B, 84 (1911), No. B 570, pp. 191–195*).—"Portions of human carcinoma implanted into animals were observed during the first 5 days to retain their vitality and to exhibit mitoses after implantation. After the expiration of this period no evidence of vitality was observed. Mitosis was markedly inhibited within 24 hours of implantation, while the life of the implanted cells was abolished less rapidly."

In regard to the behavior of Wassermann's reaction with rabbits affected with dourine, F. M. MEYER (*München. Med. Wchnschr., 58 (1911), No. 44, pp. 2318, 2319; abs. in Berlin. Tierärztl. Wchnschr., 28 (1912), No. 7, p. 127*).—The Wassermann reaction (complement fixation reaction for syphilis) was positive in from 1 to 4 weeks after infection. In some cases the reaction was present before the symptoms.

Experiences and observations in regard to combating foot-and-mouth disease by Steffen's method, N. MEYER (*Illus. Landw. Ztg., 32 (1912), No. 9, pp. 66, 67*).—This treatment consists of dusting yeast powder in the blebs and erosions of the buccal cavity and the use of yeast ointment for the foot lesions. The results obtained with the method were comparatively good.

Foot-and-mouth disease, B. BANG (*Jour. Compar. Path. and Ther., 25 (1912), No. 1, pp. 1–15*).—A paper read before a meeting at the Royal Veterinary and Agricultural College, Copenhagen, on October 16, 1911.

The precipitin-diagnostic reaction for glanders in horses, S. COSTA and A. FAYET (*Compt. Rend. Soc. Biol. [Paris], 70 (1911), No. 4, pp. 147, 148*).—The results show that Miessner's and Panisset's reactions can be obtained when mallein is injected into sound horses. This property may persist for at least 24 hours.

Trypanosomes found in Canadian mammals, E. A. WATSON and S. HADWEN (*Parasitology, 5 (1912), No. 1, pp. 21–26, pls. 2*).—The species described as new are *Trypanosoma leporis-sylvaticus*, found in the cotton-tail bush rabbit

(*Lepus sylvaticus*), at Lethbridge, Alberta; *T. peromysci*, found in northern deer mice (*Peromyscus maniculatus*, *P. nebracensis*, and other species) at Lethbridge; *T. citelli*, found in the ground squirrel (*Citellus richardsoni*), at Lethbridge; *T. rutherfordi*, found in the blood of a cow at Mount Lehman, British Columbia; *T. evotomys*, found in a vole (*Evotomys saturatus*) at Mount Lehman; and *T. soricis*, found in the blood of a wandering shrew (*Sorex vagrans*) at Mount Lehman.

Trypanosoma americanum, a common blood parasite of American cattle, H. CRAWLEY (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 145, pp. 39, figs. 15*).—This is a report of studies of the nonpathogenic trypanosome described by the author in a bulletin previously noted (E. S. R., 22, p. 281).

A résumé of the literature, first presented, is followed by reports of (1) the examination of cultures, including seasonal variation in the number of trypanosomes in blood, effect on the trypanosomes of keeping the blood before cultures were made, results obtained with measured quantities of blood, and general results of cultural work; (2) observations on fresh material, including attempts to discover the trypanosomes in freshly drawn blood, evolution of the trypanosomes in culture, movements of trypanosomes in cultures, the process of multiplication, and motility of the trypanosomes; and (3) observations on fixed material, including morphology of the forms in the blood and in culture, and cytology of the forms in culture.

The conclusions drawn are as follows: "*T. americanum* lives, in all probability as a typical trypanosome, in the blood of perhaps 75 per cent of yearling and adult American cattle, but is not present in young calves. It comes very close to *T. wrublewski* of the European bison, and may be only a variety of that species. Removal from the circulating blood stimulates multiplicative energy, apparently merely as the result of a cooler environment. Removed from the cow and placed under appropriate conditions, multiplicative energy runs far in advance of growth energy; hence the trypanosomes divide and redivide very rapidly, and in consequence become smaller than the blood forms. At the end of a few days, multiplicative energy weakening, the organisms have an opportunity to grow and to reach their normal size. The adults are at first very slender, but in time increase in breadth and may become very large. As the cultures reach and pass their maxima the individuals become club-shaped and eventually transform into rounded or oval elements, provided each with a long flagellum.

"Changes in the morphology of the nuclear system, and in the texture and chemical nature or composition of the cytoplasm, accompany changes in the facies of the entire organism. A distinguishing character is the situation of the trophonucleus, which is normally at the union of the anterior and middle thirds."

A bibliography of 13 titles is appended.

The infection of mules by Trypanosoma hippicum through mucous membranes, S. T. DARLING (*Jour. Expt. Med., 15 (1912), No. 4, pp. 367–369*).—The experiments with mules here reported indicate positively that *T. hippicum* can penetrate the mucosa of mules. From this it is assumed that murrina may be transmitted during copulation. It is stated that the disease, which has been eradicated in the Canal Zone, is still present in parts of the Republic of Panama in villages and along the trails, and that cases have been detected in native ponies near the zone line.

Investigations in regard to tuberculosis in milch cows, G. COSCO (*Centbl. Bakt. [etc.], 1. Abt., Orig., 61 (1911), No. 1–2, pp. 59–63*).—Tuberculosis may be conveyed from one bovine to another by the agency of the feces, which contains the specific living and virulent organism. Some cows, which to all

appearances have sound udders, eliminate tubercle bacilli with the milk. No tubercle bacilli could be detected in the urine. The above results were obtained with 9 bovines.

Nontuberculous milk in Guernsey, H. D. BISHOP (*Brit. Med. Jour., 1912, No. 2665, p. 217*).—"Until 1906 tuberculosis was apparently unknown amongst Guernsey cattle, but it was then introduced by cattle reimported after having been to England for exhibition. This reimportation is now forbidden and drastic laws have been passed compelling the slaughter of all infected cattle, and granting state compensation. As a result the disease has been practically stamped out, and of the 1,364 animals exported during the past 3 years, all of which were treated with tuberculin, only 6 were found to be affected. . . .

"The forms of human tuberculosis chiefly caused by bovine tuberculosis (tuberculous glands of neck, abdominal tuberculosis, and lupus) are consequently exceedingly rare in the island of Guernsey."

In regard to the course of bovine tuberculosis, C. TITZE (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 6, pp. 98–101*).—A detailed description of the cycle of tuberculosis from the time of infection to either the death of the animal and its offspring, or to the resolution of the tuberculous process.

In regard to detecting pulmonary tuberculosis in bovines, O. MÜLLER (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 10, pp. 179–183*).—A discussion in regard to the various existing methods of catching sputum from bovines for the purpose of diagnosing pulmonary tuberculosis. Tests with sound and tubecular bovines showed that the method devised by the author, and similar to that of Scharr and Opalka (E. S. R., 26, p. 679), is of value.

The tuberculin test; its value and proper uses, J. LAW (*Tribune Farmer [N. Y.], 40 (1912), No. 537, pp. 1, 2, figs. 2*).—This article deals with the factors which influence the value of the tuberculin test, and discusses its present status.

On a nematode in the connective tissue of bovines, M. PIETTRE (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 9, pp. 620–623*).—The frequent finding of calcareous deposits about the femoro-tibial articulation led the author to conduct the investigations here reported.

The lateral and capsular ligaments were found to be invaded by a filarial parasite, to which the name *Onchocerca bovis* has been given. It occurs only in fibrous tissue and almost exclusively in the thick part of the lateral and capsular tendons of the femoro-tibio-patellar articulation. The external ligament is more often invaded than is the internal. The external tibio-tarsal ligament was found to be invaded in one instance but never the cervical ligament.

This parasite is of importance pathologically because of the disorders which it causes at the place of articulation of the tendons and the resulting periarthritis.

Onchocerciasis in imported meat, H. WILLIAMS (*Pub. Health [London], 25 (1911), No. 1, pp. 8–10*).—It is stated that on a minute examination made on cutting up a number of flanks and briskets the percentage of *Spiroptera reticulata* infestation of meat arriving in England from Australia was found in many cases to be over 80, and in some cases to reach 100. This infestation is of increasing importance, since the quantity of frozen meat arriving in England from Australia is greatly exceeding that of previous years.

"When the first consignment was examined, it was thought that this parasite existed only on the surface, but a more careful examination of subsequent consignments revealed the fact that it was also to be found embedded in the deeper connective tissues, especially on the flanks and briskets. . . . The hind quarters, on careful examination, were also found to be affected, chiefly in the vicinity

of the stifle or knee joint, and a few scattered nodules on the surface of the meat. The percentage found affected is also very high, as will be seen from the following examination of the consignments from only 2 vessels. Of 4,617 hind quarters examined, 2,839, or 61.49 per cent, were found to contain the parasite *S. reticulata*. Of 805 hind quarters examined, 564, or 70 per cent, were found to be affected. . . . The worm in the hind quarters is generally situated deeply, requiring considerable cutting in order to find the worm and, when found, to insure that the whole of the worm, with the surrounding tissues, has been removed."

It is stated that the Commonwealth of Australia has instituted a rigorous system of inspection of beef for export and that in the future all flanks and briskets from fore quarters will be cut off before being allowed to leave the country.

The inheritance of spirochetal infection in Argas persicus, E. HINDLE (*Proc. Cambridge Phil. Soc., 16 (1912), No. 6, pp. 457–459*).—The experiments reported indicate clearly that once a tick becomes infected with *Spirochæta gallinarum* its offspring of the first generation is infective in all its stages, and moreover that the infection is transmitted to the second generation. "It is evident, therefore, that once the Argas of any locality become infected with spirochetosis it will be very difficult to eradicate the disease."

Investigations relative to arsenical dips as remedies for cattle ticks, B. H. RANSOM and H. W. GRAYBILL (*U. S. Dept. Agr., Bur Anim. Indus. Bul. 144, pp. 65, pls. 6, fig. 1*).—This bulletin reports the details of 22 dipping experiments of which 12 were with arsenic, soda, and pine-tar dips; 1 with arsenic, soda, and pine-tar dip containing emulsified crude petroleum; 2 with arsenic and zinc sulphate dip; 2 with arsenic-alum dip; 1 with sodium arsenate dip; 1 with sodium sulpharsenite dip; 2 with potassium arsenite dip containing soap; and 1 with repeated applications of the arsenic, soda, and pine-tar dip. In most of the experiments the arsenical solution used was a modification of the Mayo formula, the amounts of arsenic varying from 8 to 12 lbs., and of sal soda from 24 to 45 lbs., for each 500 gal. of dip, in different instances. When pine tar was used it was added in the proportion of 1 gal. to each 500 gal. of dip. In some of the experiments arsenical dips of somewhat different composition were used. The amount of arsenic in solution in the various dips, expressed in its equivalent of arsenic trioxid, varied from 0.16 to 0.495 per cent.

"The effects of the dips upon the cattle in the various experiments were almost invariably slight. . . . Cattle not infested with ticks, dipped repeatedly in a dip containing an equivalent of about 0.22 per cent arsenic trioxid at intervals of 2 and 3 weeks gained less in weight than other uninfested cattle kept under the same conditions undipped, but it is uncertain whether this difference was due to the dipping. In all cases in which cattle were dipped or sprayed once or twice in arsenical dips containing an equivalent of from 0.16 to 0.24 per cent arsenic trioxid the injurious effects observed were confined to the action of the dips upon the skin, and scarcely ever was this action more than very mild, though in some cases the animals were treated in hot weather when the injurious effects from dipping are especially likely to appear. The signs of the effects of dipping on the skin in various instances became evident in from 3 to 9 days after the treatment, at which time a more or less well-marked epidermal exfoliation or dandruff-like peeling of the superficial layers of the skin appeared, confined as a rule to the dewlap, neck, escutcheon, inner side of thighs, and scrotum. No marked inflammation preceded the exfoliation, though occasionally a slight irritation of the skin in places was observed."

The authors conclude that "cattle may be safely dipped or sprayed with arsenical dip containing an equivalent of 0.24 per cent arsenic trioxid or less,

and the treatment once repeated 7 or more days later, the only injury to be expected as a rule being more or less epidermal exfoliation, and sometimes slight soreness or tenderness of the skin, local in character."

The experiments fully confirmed the observations of various investigators and practical users of arsenical dips who have found that ticks are very sensitive to arsenic. Little is known, however, as to the avenue by which the arsenic enters the body of the ticks. After treatment with an arsenical dip the vast majority of the young adult females die before they reach the engorged stage, and the younger they are the less likely are they to survive and become engorged.

"In 6 experiments the cattle were found to be free from engorged ticks 3 to 5 days after the first treatment, in 4 other experiments they were free 7 to 9 days after treatment, in another they were nearly free 5 days after treatment, in another experiment all that were examined were free from engorged ticks 8 days after treatment, and in 2 other experiments the cattle were nearly free from engorged ticks 8 days after treatment."

In order to obtain data bearing upon the question of the fate of ticks which reach engorgement and fall from cattle subsequent to dipping, engorged ticks were collected from the cattle in the various experiments immediately after treatment and on successive days thereafter and kept under observation. "Whereas in many of the lots from treated cattle all of the ticks died without ovipositing, in most cases some of the ticks deposited eggs, the percentage of ticks ovipositing usually being low, although in rare instances as high as 100 per cent." Ticks from treated cattle which survived to deposit eggs nearly always deposited a much smaller number than ticks from untreated cattle, and moreover, they rarely hatched. Out of approximately 70 lots of ticks from treated cattle, only 4 lots deposited eggs which hatched.

"Judging from these results it would appear that the hatching of eggs deposited by ticks which survived treatment with arsenical dips is a rather rare occurrence. Furthermore, it has been noted that the larvæ from eggs deposited by females which have been subjected to arsenical solutions are frequently in such a weakened condition that they can not emerge from the eggshell, or they may become lodged in the opening of the ruptured shell and fail to extricate themselves, or show such slowness of movements after emerging as to make one believe that they could not effect a successful attachment after reaching a host, a condition of the larvæ which has also been noticed in the case of eggs subjected to unfavorable conditions, such as low relative humidity and low temperatures."

The data relative to the ticks removed from cattle after treatment and their corresponding control from untreated cattle, and to engorged ticks dipped in the laboratory, are presented in tabular form.

"Very few male ticks were found alive on cattle later than a day or two after treatment, and it is probable that most of these were ticks which were in the nymphal stage at the time of treatment. It may therefore be concluded that arsenical dips are highly efficacious so far as the destruction of male ticks is concerned. . . . The vast majority of nymphs were killed by a single treatment. In several experiments, however, some of the nymphs survived and afterwards molted. . . . No instance was observed in any of the experiments of the survival of ticks in the larval stage after a single treatment with an arsenical dip."

The bulletin concludes with a discussion of the practical significance of results of experiments with arsenical dips, taking up the composition of the dip, method number, and frequency of applications, and handling the cattle.

A plan is given for a draining pen for cattle after dipping.

Parasitic gastritis of sheep, E. G. HASKELL (*Vet. Rec., 24 (1912), No. 1239, pp. 473–475*).—It is stated that flocks of sheep in certain parts of the southwest of England have suffered severely from parasitic gastritis, due to *Strongylus cervicornis*, and that the mortality is still continuing. In west Somerset the greatest number of deaths was observed among ewes of all ages, though lambs a year old were also affected.

The thermo-precipitin reaction as a general sero-diagnostic method; its use for diagnosing swine erysipelas, A. ASCOLI (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 10, pp. 165–167, figs. 3*).—This reaction (E. S. R., 26, p. 375) can be employed without difficulty for diagnosing erysipelas in swine. The technique is given in detail.

Actinomycosis of the rectum in the horse, H. MARKUS (*Tijdschr. Veeartsenijk., 38 (1911), No. 9, pp. 349–353, pl. 1; abs. in Vet. Rec., 24 (1911), No. 1221, p. 339*).—The author records a case of this affection in a 4-year-old Oldenburg mare.

Studies on etiology of equine influenza, N. S. FERRY (*Abs. in Science, n. ser., 35 (1912), No. 893, pp. 239, 240*).—From each case of equine influenza studied the streptococcus described by Schütz was isolated from the trachea. The *Bacillus equisepticus* was never noted. In addition, a similar organism was isolated from the blood of 34 out of 63 cases. The organisms grew well symbiotically with the staphylococcus in broth cultures. It was possible for the organism to pass through the Berkefeld and Chamberland filters, and in all probability it assumes a minute size during its life cycle, as indicated by Basset (E. S. R., 26, p. 384).

The author was not able to differentiate between this organism and the streptococcus isolated from abscesses in the case of strangles. "If this proves to be the same organism that is found in strangles and also contagious pneumonia, and it is agreed by all authorities that the streptococcus found in strangles is the cause of that disease, then, we believe, we are justified in putting forward the argument that this streptococcus is the cause of the symptom complex we have termed 'influenza,' and that strangles and contagious pneumonia are not clinical entities, but complications of influenza due either to secondary infections or to extension of the primary disease."

In regard to the treatment of lymphangitis by "606," J. BRIDRÉ, L. NÈGRE, and G. TROUETTE (*Bul. Soc. Path. Exot., 4 (1911), No. 6, pp. 380–383*).—The disease in all of its phases in horses and mules was treated successfully with Salvarsan (Ehrlichs 606). In all instances the diagnosis was confirmed by finding the micro-organisms in the pus. Only 1 out of 9 animals died.

Filaria immitis of the dog, D. ZIBORDI (*Clin. Vet. [Milan], Sez. Prat., 33 (1910), Nos. 43, pp. 684–689; 44, pp. 697–704; 45, pp. 713–717; 46, pp. 734–740; Jour. Trop. Vet. Sci., 7 (1912), No. 1, pp. 68–84*).—A review of the subject is followed by reports of studies of 6 cases, together with a bibliography of 41 titles.

RURAL ENGINEERING.

Rules governing matters coming before the State Board of Irrigation, Highways, and Drainage ([*Lincoln*], *Nebr., 1912, p. 27*).—This pamphlet gives the rules of procedure adopted by the State Board of Irrigation, Highways, and Drainage of Nebraska governing matters coming before it relative to claims, applications, dams, petitions, and contests.

Irrigation pumping with electrical energy (*Elect. World, 59 (1912), No. 15, p. 804*).—An example of the use of electrical energy for irrigation pumping is noted, embracing an area of 10,000 acres and with 69 motor-driven pumping

plants having capacities ranging from 900 to 1,700 gal. per minute. The pumping system is owned by the farmers of the region, but the energy is developed by a private plant. It is claimed that the cost of the energy is less than 1 ct. per kilowatt hour.

The amount and frequency of irrigation as determined by the physical properties of the soil, A. MÜNTZ and E. LAINÉ (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 8, pp. 481–487; Prog. Agr. et Vit. (Ed. l'Est Centre), 33 (1912), No. 12, pp. 360–366; Rev. Vit., 37 (1912), No. 955, pp. 460–464; abs. in Rev. Sci. [Paris], 50 (1912), I, No. 9, pp. 284, 285*).—Experiments were made to determine (1) the amounts of water most favorable to crops when applied at equal intervals, and (2) the influence on yield of the application of equal quantities of water at irregular intervals.

The results show that there is ordinarily a decided waste of water, as the real needs of plants are greatly exceeded. The authors are of the opinion that, although it is impossible to attain the ideal in the application of water, efforts should be made to approach it.

An interesting agricultural, hydraulic problem in Algeria, J. SAVORNIN and I. POUGET (*Bul. Soc. Hist. Nat. Afrique Nord, 1910, Nos. 7, pp. 104–108, fig. 1; 8, pp. 123–127*).—The authors present a solution to the problem of utilizing the basin and waters of a salt lake for irrigation purposes, viz, to divert the neighboring running water and rainfall waters into the lake and provide an outlet sufficient to lower the lake surface about 6 meters. These works, it is claimed, will reduce the surface evaporation, freshen the water, and keep a good supply of water on hand.

A diagram for converting square feet into acres in irrigation and drainage work (*Engin. and Contract., 37 (1912), No. 16, p. 450, fig. 1*).—A combined table and diagram is presented and explained, giving accurate results to the third decimal place.

Cooperative methods in farm drainage, R. H. CLEMENS (*Canad. Farm, 6 (1912), No. 13, p. 3, figs. 3*).—The trouble and expense encountered in the ordinary drainage ditching methods are pointed out, and the economic and time-saving advantages of cooperative drainage-ditching operations are discussed.

Standard tests of drain tile and sewer pipe, A. MARSTON and A. O. ANDERSON (*Proc. Iowa Engin. Soc., 23 (1911), pp. 39–46*).—This is a paper read before the Iowa Engineering Society, at Des Moines, February 15–17, 1911.

The need of standard tests for drain tile and sewer pipe is pointed out and 3 standard test requirements are recommended, viz, the percentage of absorption, the bearing strength, and the modulus of rupture, which requirements involve the absorption test and the bearing strength test. A discussion is given of various methods of making absorption and bearing strength tests, and specifications are recommended for making standard tests of this nature.

In the standard absorption test the specimens are to be of a definite size and number, perfectly dry and clean, and are to be weighed and then immersed in pure soft water for 24 hours. They are then to be taken out, reweighed, and the percentage of absorption calculated by the formula $\frac{W'-W}{W}$=the percentage of absorption, in which W is the original weight and W' is the weight after immersion.

The standard bearing strength test embodies the following: The test specimens are to be whole, full-sized, dry, average tile, 5 in number. They are to be weighed before the test and then bedded above and below in dry washed sand for one-fourth the circumference of the pipe. The top bearing must have a true plane lower surface of rigid material capable of distributing the test

load without any appreciable bending and the test load is to be applied at the exact center of this top bearing. The frames for top and bottom bearings are to be of sufficiently heavy timber to avoid any bending by side pressure. The test load is to be applied continuously and gradually without shock or disturbance to the tile and no considerable time is to elapse between load additions. The bearing strength is taken equal to the total top load plus the weight of the frame and bearing timbers, sand, etc., plus five-eighths the weight of the pipe. This load is to be divided by the length of the pipe in feet to give the bearing strength in pounds per foot.

The modulus of rupture in pounds per square inch is then calculated by the formula $F=\frac{b\times r}{t^2}$, in which b=bearing strength per linear inch, r=the mean radius of the tile in inches, and t=the minimum thickness of the tile at the top and bottom in inches.

A method of making tests on drain tile, A. N. Talbot and D. A. Abrams (*Engin. Rec., 65 (1912), No. 14, pp. 384, 385, figs. 2*).—This is a paper read before the Eighth Annual Convention of the National Association of Cement Users. It points out the need for inexpensive adjustable, portable, and accurate testing machines for definite and important qualities of drain tile, and describes and gives tabulated results of 3 series of tests of tile with such a machine.

The machine consists essentially of a simple framework and a lever for applying the load by means of dead weight. The framework is adjustable and can hold any diameter of tile up to 42 in. The top and bottom loading blocks are 4 by 6 in. material and provided with bearing edges and rubber hose cushions for distributing the load uniformly over the length of the tile. The lever is 4 ft. 6 in. long and the dead load is applied to its end. The machine weighs 225 lbs. and the authors claim that it should not cost more than $18.

In using the machine, the tile is rolled into place on the bottom loading block which has 2 half round strips 2 in. apart for rest and the framework is adjusted to the size of the tile. The top loading block is placed on the top of the tile, the lever fitted into place, and the dead load is applied at the lever's end.

Whatever the method of test may be, it is necessary finally to determine the relation between the strength of the piece tested and the strength needed in the structure. The method of loading along a line at the top and bottom of the tile is selected because of its simplicity, and because it gives simple, direct, and fairly uniform results for varying conditions of tile. The bending moment developed, the modulus of rupture, and the load per foot of length of pipe of given size can be determined by these tests. The authors give as the expression for bending moment the formula 0.16 Qd, in which Q is the concentrated load applied to the crown, and d the mean diameter. The formula for modulus of rupture is given as $f=0.96\ Qd\ l/t^2$, in which l is the length of tile and t the thickness along the top and bottom elements.

Preserving good roads, L. W. Page (*Sci. Amer. Sup., 73 (1912), No. 1892, p. 210*).—The use of motor-truck trains in the maintenance of trunk highways is discussed and the necessary equipment noted.

An automobile equipment is suggested which will include all the apparatus and facilities necessary to employ efficiently a repair gang of 8 men in the maintenance of the road surface over 100 miles of roadway or more. Three significant requisites mentioned are that the cost of the equipment should be kept consistently low and within the range of customary expenditures, that novel or specially constructed apparatus should be avoided, and that the outfit should be so flexible in its makeup as to serve readily a variety of utility or lend itself to peculiar requirements under varying conditions. An approximate estimate of the total equipment is as follows: Machine with steel dumping

body, $6,000; electric hoist, $250; horsepower spreader with rotary pump and piping, $700; 500 gal. tar kettle, $300; double kerosene burner outfit, $200; and tools and accessories, $50; total $7,500.

Changes noted in a tar exposed to traffic and weathering when used in a road surface, W. W. Crosby (*Surveyor, 41 (1912), No. 1055, pp. 526, 527*).—The results of tests of the carbon-free extract of portions of a coal-gas tar-road surface, which had been exposed to weather and traffic for 3 years, are reported.

Among the changes noted, the lowering of the melting and initial boiling points is very marked. The opinion is expressed that the distillation of bituminous compounds is materially affected by the presence of free carbon, and that a secondary analysis should be made of all bituminous materials containing it in appreciable amounts.

Highway laws of the United States (*Good Roads, n. scr., 3 (1912), No. 14, pp. 215–223*).—Brief digests are given in this article of the laws affecting road administration, construction, and maintenance in the several States.

Concrete construction on the live-stock farm (*U. S. Dept. Agr., Farmers' Bul. 481, pp. 32, figs. 24*).—This bulletin deals with the construction of concrete feeding floors, manure pits and basins, and dipping vats.

The advantages of a concrete feeding floor pointed out are cheapness, durability, sanitary qualities, saving of grain, labor, and manure, and neat appearance. The essential details of construction of concrete feeding floors for cattle, hogs, sheep, and poultry are discussed under the subheads of materials, location, grading, drainage, necessary equipment, apportioning and mixing the concrete, general method of construction, and curing. A short statement of cost is also given.

The wastefulness of the ordinary methods of manure storage is pointed out and directions are given for the proportioning of concrete and the general construction of concrete manure basins and shallow manure pits. The important points to be considered in the planning, construction, and care of concrete dipping vats are also pointed out and discussed, and the construction details are given.

The action of alkali salts upon Portland cement, E. Burke and R. M. Pinckney (*Jour. Indus. and Engin. Chem., 3 (1911), No. 5, pp. 317–326*).—Previously noted from another source (E. S. R., 25, p. 490).

Practical barns in use on northwestern farms, S. K. Haugen et al. (*Farmer, 31 (1912), No. 16, pp. 584, 588–591, figs. 23*).—Plans and descriptions are given of barns as worked out and proved satisfactory by actual farm experience.

Economy in sanitary barn construction, H. G. Lotter (*Farmer, 31 (1912), No. 16, p. 583, figs. 3*).—The author describes economic methods of sanitary cow barn construction, and discusses, as the main essentials of construction, drainage, warmth, ventilation, light, and easy handling of feed and refuse.

Cement silo construction, M. S. King (*Cement and Engin. News, 24 (1912), No. 4, pp. 123–125*).—The author points out the essential requirements of silos and deals especially with masonry silos, discussing their lasting qualities and such construction details as reenforcing, foundations, doors, and roofs.

Open-air poultry houses for all climates, P. T. Woods (*Chicago, 1912, pp. 86, pl. 1, figs. 44*).—Many types of open-air poultry houses are illustrated and described.

Electricity in agriculture and reference to central rural plants, H. Wallem (*Die Elektrizität in der Landwirtschaft und deren Beziehungen zu Überlandzentralen. Diss. Tech. Hochschule Karlsruhe, 1910, pp. 46, figs. 21*).—This pamphlet deals with the use of electricity in the operation of agricultural

machinery, reviewing the most important agricultural implements, discussing the use and advantages of electricity in the operation of plows and threshing machines, elevators, unloading apparatus, and drying plants, discussing electroculture and rural electric roads for farm traffic, and calculating the entire amount of electrical energy needed on a 2,000-acre farm. The economics of central agricultural electric plants and the prospective demand for electrical agricultural machinery are also discussed.

A grouped electrical unit, H. D'ANCHALD (*Jour. Agr. Prat., n. ser., 23 (1912), No. 4, p. 119, fig. 1*).—An electrical unit for supplying electric light on a farm is described consisting of a low-speed gas-motor, dynamo, rheostat, and storage battery.

Gas lighting for the farm, F. B. CARPENTER (*Minn. Farm Rev., 17 (1912), No. 4, pp. 74–76, figs. 3*).—The author deals briefly with small gas generating systems for farms, describing the gasoline gas, acetylene gas, and blau-gas systems. He points out the advantages relative to safety, durability, and efficiency of these gas systems over the ordinary oil, gasoline, and kerosene methods of lighting and cooking, and discusses initial cost and cost of operation.

Farm and barn conveniences (*Farmer, 31 (1912), No. 16, pp. 593–595, 597, figs. 5*).—Brief descriptions are given of some of the modern devices for lightening labor and saving time on the farm, among which are the farm power house, hydraulic ram, hay tools in the barn, barn door hangers, dairy room, milking machines, litter carriers, barn lighting and ventilating, gates and fences, and improved water supply.

Farm implements, P. MCCONNELL (*Jour. New Zeal. Dept. Agr., 4 (1912), No. 2, pp. 89–93, fig. 1*).—This article deals with the use, care, and development of farm machinery in general, and shows the need of a knowledge of applied mechanics among farmers.

New agricultural machinery, especially for motor cultivation, MARTINN (*Ztschr. Landw. Kammer Schlesien, 15 (1911), Nos. 39, pp. 1222–1225, fig. 1; 40, pp. 1262–1269, figs. 3; 41, pp. 1291–1298, figs. 7; 42, pp. 1324–1328, figs. 5; 43, pp. 1355–1357, figs. 5; 44, pp. 1387–1392, figs. 8*).—A discussion is given of the operation, initial cost, and cost of operation of steam and internal combustion motor plows. A number of improved agricultural implements are described and their costs discussed, among which are improved hay forks, potato diggers, turnip headers, manure spreaders, milking machines, straw stackers, subsoil plows, and side delivery hay rakes.

The engine gang (*Canad. Thresherman and Farmer, 17 (1912), No. 4, pp. 10, 11, 14, 16, 18, 20, figs. 39*).—This is a brief review of the development of the ordinary plow through the ages, and deals especially with the development of the engine gang plow during the past few years, discussing the improvements in construction and operation of several special types.

Diagram of ditching plow, with details for construction and approximate cost, T. B. WILSON (*N. Y. Dept. Agr. Circ. 45, 1911, pp. 3, figs. 3*).—A list of materials, dimensions, approximate cost, etc., of a ditching plow is given, accompanied by a lettered diagram.

Two machines in one (*Farm Machinery, 1912, No. 1070, p. 16, fig. 1*).—A combination of hay tedder and side delivery hay rake is described.

Motor-driven milking machines, F. D. BURR (*Elect. World, 59 (1912), No. 16, pp. 855–857, figs. 2*).—A system of motor-driven milking machines is described, consisting of a motor-driven rotary vacuum pump to the suction end of which is connected a pipe line which extends through the cow barns and communicates with the milking machines.

Horses and stock currying machines (*Wiener Landw. Ztg., 62 (1912), No. 20, p. 240, figs. 5*).—Machines for currying horses and cattle are described, and

cost data are given for hand and motor driven currying machines and combination currying and shearing machines.

RURAL ECONOMICS.

[How will an increase in crop output affect prices and incomes?] (*Farmers' Rev., 44 (1912), No. 10, p. 259*).—This article illustrates by the table below, compiled from census reports, that an increase in output of farm products in the United States will not necessarily mean a decrease in price per unit or in total amount received.

Total output, value, etc., of farm products in the United States, 1900–1910.

Crop.	Total output.			Increase in output.	Total value.			Increase in value.
	1900	1905	1910		1900	1905	1910	
	Bushels.	*Bushels.*	*Bushels.*	*P. ct.*				*P. ct.*
Corn....	2,105,102,516	2,707,993,540	3,125,713,000	50	$751,222,033	$1,116,696,738	$1,523,968,000	100
Wheat..	522,229,505	692,979,489	695,443,000	33	323,515,177	518,372,727	621,443,000	92
Oats....	809,125,989	953,216,197	1,126,765,000	39	208,669,233	277,047,537	384,716,000	84
Potatoes	210,926,897	260,741,294	388,811,000	60	90,811,167	160,121,080	187,985,000	107

Other illustrations are given showing the total value of farm crops to have increased from $5,017,000,000 in 1900 to $8,926,000,000 in 1910. Nevertheless the total value of beans, peas, onions, and potatoes imported increased from $5,092,932 in 1906 to $8,273,371 in 1910.

From producer to consumer, M. C. SMITH (*Farmers' Rev., 44 (1912), No. 14, pp. 4, 18, figs. 2*).—This is a popular article describing in more or less detail the establishment and success of a public market in Rockford, Ill., where producer and consumer are enabled to complete their marketing transactions without the aid of the middleman.

Farm management, W. M. HAYS ET AL. (*Minnesota Sta. Bul. 125, pp. 7–44, pls. 5, figs. 10; U. S. Dept. Agr., Bur. Plant Indus. Bul. 236, pp. 7–44, pls. 5, figs. 10*).—The term "farm management," is said to include "the selection, planning, organization, and development of the farm and the daily and yearly conduct of the farm business," and "the object sought in research in farm management is to secure the elementary facts which must be utilized in organizing and conducting the business of the farm in such a way as to give the maximum of products, profits, and enjoyment to the owner and to the farm family, to supply farm products in the best way to all who need them, and gradually to increase the productivity of the soil."

In addition to discussing and outlining the scope of farm management this portion of the bulletin presents a number of results obtained from investigations made for the purpose of determining the best methods of crop rotation and the cost of producing farm products in Minnesota (E. S. R., 21, p. 188). It also discusses and illustrates by means of tables and charts methods of planning the farm and its business organization, planning fields for rotation of crops, comparing cropping schemes with standard rotation, showing profits and losses, the use of cost statistics of farm products, value of farm products, etc.

The outlook for agriculture in the Canal Zone, W. A. TAYLOR (*U. S. Dept. Agr., Rpt. 95, pp. 39–49, pls. 2*).—From a study of the climate, soil, crops, and other conditions bearing upon the development of agriculture bordering the Panama Canal, observation discussions are given of the humid tropical climate; broken topography of the surface and the clayey nature of most of the

soil; present crops and methods; present and prospective demand for fresh vegetables; fruits, milk, and poultry products; scarcity of live stock; character of the population; and land titles and tenures.

It is concluded that large farming operations are impracticable on account of the broken topography; that the staple crops best adapted to the conditions are corn, cassava, yams, sugar cane, plantains, bananas, and upland rice; and that the most promising outlook is the development of a permanent mixed tropical agriculture with a distinct horticultural trend, in which hand labor of tropical origin will be the main dependence for tillage.

[Agricultural resources in Italy], A. PUGLIESE (*Staz. Sper. Agr. Ital., 44 (1911), No. 5–6, pp. 317–413*).—Tables state by provinces the areas and normal annual yields of various regions of Italy and the yields secured in 1909–10, the total number of farm animals in each of the countries of Europe, the number per thousand inhabitants and per thousand hectares, and other data of a similar nature. The greater portion of the article is made up of lists of the field plants most commonly found in each of a considerable number of localities in Italy.

Agricultural statistics in Roumania, 1911 (*Min. Agr. Statis. Agr. Românici, 1911, pp. 37*).—A statistical report of the minister of agriculture, showing the area and production of the leading crops in Roumania, together with tables illustrating to what extent crops were damaged by hail, drought, frost, etc. for the year 1911.

[**Agricultural statistics**] (*Statis. Abs. Brit. Self-Gov. Dominions [etc.], 48 (1896–1910), pp. 296–356*).—Official statistics are given showing the acreage and production of the leading agricultural crops in the British self-governing dominions, crown colonies, possessions, and protectorates from 1896 to 1910 inclusive, together with exports and imports of agricultural products by countries.

Report on the land settlement scheme, H. WALWYN (*Imp. Dept. Agr. West Indies, Rpt. Bot. Sta. Grenada, 1910–11, pp. 18–20*).—Regarding the land settlement scheme in Grenada initiated in 1910 by the appropriation of £5,000 by the government for the purchase and allotment of lands, the land officer reports that about 153 acres have been purchased at a cost of £495 and subdivided into 47 allotments of 2, 3, 4, and 5 acres. The allotments are to be sold to peasants upon the approval of an application and the payment of 25 per cent of the purchase money as a first installment. The peasant then receives a permit to occupy the land, the remainder of the money is divided into 9 equal parts, and after the expiration of 3 years he pays an annual installment of one of these parts, with 5 per cent interest on all unpaid purchase money each year after the payment of the first installment.

Applications have been received for 32 allotments, and 27 of them approved. Two allotments of 4 and 5 acres have been reserved for the purpose of experiments and demonstrations, to enable the land officer to distribute to allottees plants free or at very little cost.

Agricultural cooperation [in France], A. GAULIN (*Daily Cons. and Trade Rpts. [U. S.], 15 (1912), No. 93, pp. 259–262*).—This is a report from the Marseille consular district showing that agricultural syndicates for collective buying, handling, and selling agricultural products have been of considerable advantage to the farmers of the district, the sales to farmers being made at cost price, plus a commission of 1 to 3 per cent for running expenses. If there are any profits they are not distributed but are frequently applied to the purchase of machinery for collective use, which has aided many of the small farmers in lowering their cost of production.

It is claimed that the syndicates have brought about reductions of from 30 to 40 per cent in the prices of fertilizers, and aided materially in lowering the

prices on other commodities, besides checking frauds and compelling the delivery of pure products.

Agricultural credit in France, H. SAGNIER (*Le Crédit Agricola en France. Paris, 1911, pp. XV+158*).—This book presents a historical summary of the organization and growth of agricultural credit organizations in France, showing the work of the early organizations, agricultural syndicates, and banks, and the application of legislation to the movement up to 1910.

The act of 1897 provided for the establishment of small local credit societies or village banks, together with a district bank, through which they receive their share of the funds allotted by the State out of the loan and royalties paid to it by the Bank of France. The local societies or village banks may secure additional funds from the district bank, which it obtains from the ministry of agriculture free of interest for a period of 5 years, with power to renew, and to the amount of four times its paid-up capital. Loans may be made for periods not exceeding 25 years for the purpose of aiding in the production and sale of agricultural produce, erection of farm buildings, etc.

At the end of 1910 there were 96 district banks and 3,338 village banks with a membership of 152,000. Loans made during the year amounted to 70,533,340 francs and repayment of loans to 61,388,806 francs. See also a previous note (E. S. R., 23, p. 291).

Systems of rural cooperative credit (*U. S. Senate, 62. Cong., 2. Sess., Doc. 574, 1912, pp. 47*).—This document gives a detailed outline of cooperative credit systems in European countries as compiled from publications of the International Institute of Agriculture. It illustrates the workings of the personal and real credit systems, and shows the peculiar functions and success of each, together with the work of the rural, local, popular, central, and general banks in various countries.

Agricultural credit (*U. S. Senate, 62. Cong., 2. Sess., Doc. 572, 1912, pp. 27*).—This document presents the general theory of cooperative credit and its application in France and other foreign countries; the uses to which rural credit may be applied, as personal necessities and public requirements; the guiding and working principles of the organizations; and the connection existing between the local rural credit banks and the district banks.

German agricultural credit system, H. C. PRICE (*Rural New Yorker, 71 (1912), Nos. 4145, pp. 453, 454; 4146, p. 487*).—This article treats in a general way of the system of German agricultural credit successfully operated for more than a century, showing the different organizations for credit and their relation to the ordinary farmer, and how they supply him with loans for long periods at rates of interest varying from 3 to 5 per cent. Features of the loans which make them especially favorable to the farmer are as follows: (1) The rate of interest at which they are made can not be raised; (2) they can not be called in except for specific reasons, such as the waste of the property or flagrant misuse of it; (3) the right is granted to pay back the loan in part or in whole at any time on giving notice the required length of time in advance, which is never over 6 months; and (4) by paying annually on the principal from 0.5 to 0.75 per cent of the loan, the loan is gradually paid off.

Agricultural credit banks [in Victoria], A. T. SHARP (*Jour. Dept. Agr. Victoria, 9 (1911), No. 12, pp. 800–805*).—This is a discussion as to the purpose of agricultural credit systems, their adaptation to different conditions; and their origin and growth in a number of countries.

Special attention is directed to the establishment, work, and growth of the Victoria credit bank organized in 1906 with a capital of £117, which has increased to £2,343 with 1,180 shareholders. Loans granted since its organization number 1,744, totaling nearly £19,000, paying an average dividend of 4.8

per cent per annum. Loans have been made for the following purposes: Liquidation of loans obtained at usurious rates; construction and repair of dwellings; deposits on land; purchase of horses, cows, and farm implements; and payments of university fees to enable students to complete their courses, etc. It is stated that only one loss has been sustained.

Insurance against forest fires [in Germany] (*Bul. Mens. Off. Renscig. Agr. [Paris], 11 (1912), No. 2, pp. 212, 213*).—The object of insurance against forest fires is stated as to compensate the owner for forests burned or for the expense of reforestation. The growing need for such insurance is said to be due to the increased number of industrial establishments and railways in the vicinity of forests, and the reforestation of uncultivated lands with such trees as the fir, pine, or other conifers, which more easily take fire than deciduous trees. The premium is fixed according to the kind and age of trees, varying from 0.25 to 4 marks per thousand.

AGRICULTURAL EDUCATION.

Reorganization of agricultural education, R. J. Huergo (*Reorganizacion de la Ensenanza Agricola. Buenos Aires, 1908, pp. 286, figs. 9*).—This is a report by the division of agricultural education to the minister of agriculture of Argentina on the reorganization of the system of agricultural education authorized December 27, 1907, and the work accomplished from January to July, 1908.

The new scheme includes higher instruction, special instruction of a technical-practical character adapted to local conditions, practical instruction for future agriculturists and horticulturists, and extension work. The higher instruction is now being offered by the Agricultural and Veterinary Institute at Buenos Aires and the agricultural and veterinary faculty of the National University at La Plata; the special instruction by the School of Agriculture and Husbandry at Cordoba, the School of Viticulture at Mendoza, and the School of Arboriculture and Sugar Technology at Tucuman, with their experiment stations; the practical instruction by the Practical School of Horticulture and Arboriculture at Casilda, the Practical School of Dairying at Bell-Ville, the Practical School of Forestry at Benitez, the Practical School of Subtropical Agriculture at Posadas, and the Practical School of Fruit Culture at San Juan, all offering 3-year courses. The extension work includes practical courses for young people and adults, itinerant courses, correspondence, cooperative experiments, local gatherings and expositions, encouragement to agricultural associations and syndicates, and the organization of district agronomes. An article on the object of practical schools of agriculture, by P. J. Iribarne, regulations for various kinds of works, and data on the organization and courses of study of the practical schools, are appended.

Agricultural work in the schools of Pulaski County, H. L. Rogers (*Purdue Univ., Dept. Agr. Ext. Bul. 3, 1912, pp. 11, figs. 10*).—This is an account of the 1909, 1910, and 1911 exhibits of the Pulaski County Corn Club, the results of these exhibits, and particulars concerning the 1912 contest.

French itinerant agricultural domestic science schools, A. Ducloux (*Indus. Lait. [Paris], 37 (1912), No. 10, pp. 145–147*).—The author gives a brief account of itinerant domestic science instruction in France, results obtained in Oise, Pas-de-Calais, and Nord, the qualifications and preparation necessary in the teaching staff, and the outlines of a 3 months' course.

Organization of agricultural women in Belgium (*Dept. Agr. and Tech. Instr. Ireland Jour., 11 (1911), No. 4, pp. 639–644, pls. 2*).—This article discusses the economic importance of women's work on the farm, and shows to

what extent they have organized in Belgium for the purpose of becoming more efficient in performing the duties which fall to their charge on the farm and in the home. It is noted that from a numerical standpoint the woman on the farm is a very important factor in Belgium social economy, there being 385,000 and 325,000 women employed, respectively, in commerce and industry, while no less than 514,000 are engaged in agricultural work, principally dairying and poultry raising.

The organization known as Cercles de Fermières was founded in 1906 with 2 "cercles" and 115 members. The "cercles" in 1910 numbered 74 and had a membership of 6,929. Their work of the organization is primarily agricultural extension instruction by means of lectures, libraries, shows, competitions, and the like, but also embraces the social and moral advancement of the rural population. Among the lectures and demonstrations given for the last few years the following subjects are noted: The fermière, her mission as housemother, housewife, and farm assistant; practical poultry keeping; utilization and preserving of fruit; butter making; kitchen gardening; stable hygiene, and the rational feeding of cows; advantages of cooperative dairying; care of young farm animals; the preparation of food; the feeding and diseases of children; antituberculosis hygiene; care of clothes and furniture; farm bookkeeping; the organization of agricultural banks; and the proper investment of money, etc. The lectures in 1906 numbered 4 and the attendance 90, and in 1910, 232 and 14,290, respectively.

The "cercles" may be organized in such a way as to secure benefits and subsidies from the ministry of agriculture.

The teaching of farm management, W. M. Hays et al. (*Minnesota Sta. Bul. 125, pp. 44–96, figs. 47; U. S. Dept. Agr., Bur. Plant Indus. Bul. 236, pp. 44–96, figs. 47*).—An effort is made in this bulletin to bring the subject matter of farm management into better pedagogical form to serve as a guide in teaching farm management in the rural and higher agricultural schools. The following phases of the subject are discussed and illustrated: The teaching of farm management; teaching farm organization in consolidated rural schools; the key-map method of organizing the farm; and teaching farm management in agricultural high schools. The illustrations given are results of a special study in connection with the School of Agriculture of the University of Minnesota and the Minnesota Station.

The appendix contains instructions to students for planning a farm and gives plans of 17 different farms as prepared by students, together with the instructor's criticisms.

The soil: Its use and abuse, E. O. Fippin (*Cornell Reading-Courses, Soil Ser., 1911, No. 1, pp. 16, figs. 14*).—The author discusses soil formation, soil types, humus, soil moisture, food supply, tillage, and soil improvement, and gives a list of publications of interest.

Seed testing, W. L. Oswald (*Nature-Study Rev., 8 (1912), No. 1, pp. 12–21, figs. 9*).—The object of this paper is to show how both purity and germination tests can be made in schools or at home without the use of expensive apparatus. A weed-seed case prepared by the seed laboratory of the Minnesota Agricultural Experiment Station, a germination box, and rack for holding ears of corn in the individual-ear germination test of corn are illustrated and described.

Logging and lumbering or forest utilization, C. A. Schenck (*Darmstadt, Germany, [1912], pp. 189, figs. 270*).—This is a text-book for forest schools dealing with both lumbering operations and wood manufactures.

Some observations on bird families, D. E. Minnich (*Nature-Study Rev., 8 (1912), No. 1, pp. 24–31*).—Observations are given of families of downy

woodpeckers, red-headed woodpeckers, brown thrasher, and wood thrush, collected by observers working in relays.

Our friend the horse, C. T. Benson (*Mason City, Iowa, 1912, pp. 6*).—Suggestions for use in the fifth, sixth, seventh, and eighth grades of the rural schools are offered for the study of the horse, including directions for judging draft horses.

Incubation. I, II, F. T. Finch (*Cornell Reading-Courses, Poultry Ser., 1911, Nos. 1, pp. 17–27, figs. 13; 2, pp. 29–44, figs. 15*).—These lessons discuss the principles of incubation, incubators and their fixtures, incubator cellars, oil supply, and the operation of incubators.

Knots, hitches, and splices, H. W. Riley (*Cornell Reading-Courses, Rural Engin. Ser., 1912, No. 1, pp. 45–88, figs. 159*).—Directions and illustrations are given for making knots, hitches, and splices of use on the farm.

1911 autumn bulletin (*Columbus, Ohio: State Supt. Agr. Ed.* [*1911*], *pp. 20*).—This bulletin is issued for teachers by the State Commissioner of Common Schools and the supervisors of agricultural education of Ohio. It suggests an outline for fall nature study work for the first 6 grades, also of elementary agriculture for grades 7 and 8, in which a text-book of elementary agriculture should be used. A study of corn and helps for teachers, including literature and brief study outlines of wheat and other grains, weeds, insects, forage crops, dairying, and milk are given to be used in connection with the course of study, also suggestions for the development of the social life of the rural community.

1911–12 winter bulletin (*Columbus, Ohio: State Supt. Agr. Ed.* [*1911*], *pp. 12*).—This outlines nature study work for grades 1 to 6, inclusive, and gives suggestions for a study of farm animals, farm machinery, and soils for grades 7 and 8. Literature for the use of the teacher is suggested.

Housekeeping and household arts, Alice M. Fuller (*Manila, 1911, pp. 178, pls. 17*).—This manual, while intended mainly as a guide for teachers, may be used as a text-book in the elementary schools or as a cookbook in the home. Instruction in sewing, cooking, housekeeping, hygiene, and ethics is outlined for seven grades. A list of equipment for an intermediate school, a glossary of terms used, recipes for cooking rice, and an index to recipes are appended.

Course in domestic science, [Neale S. Knowles] (*Iowa State Col., Ext. Dept. Circ. 15, 1912, pp. 28, figs. 13*).—This course comprises 5 cooking lessons and 5 sewing lessons.

Reading in the farm home, Martha Van Rensselaer (*Cornell Reading-Courses, Rural Life Ser., 1912, No. 1, pp. 85–101, figs. 3*).—The author discusses the benefits of acquiring the reading habit, the choice of books and method of reading, and related topics. A list of agricultural reference books on poultry, dairying, horticulture, and general agricultural subjects, and suggested lists of nature books and books on home economics, are given.

Reading in the farm home, Caroline Webster (*Cornell Reading-Courses, Rural Life Ser., 1912, No. 1, pp. 102–108, figs. 2*).—Lists of poems, outdoor books, books of inspiration, books for boys and girls, and technical books are suggested.

Report of the extension service for two years, 1909–1911, W. D. Hurd (*Mass. Agr. Col. Bul., 4 (1912), No. 1, pp. 32*).—This is a report on the growth of the extension movement, what extension work is, and the organization and work of the extension service at the Massachusetts Agricultural College, including short winter and summer courses given at the college, special days for foreigners, agricultural organizations, etc., and instruction given away from

college; a summary of what the extension service has accomplished, and its future needs.

Agricultural extension service, H. L. RUSSELL (*Wisconsin Sta. Bul. 218, pp. 33–56, figs. 4*).—An account is given of the agricultural extension service, comprising (1) demonstrational and educational work carried on during the summer in the field, and (2) extension courses of instruction held during the winter months.

The demonstration work consists of practical field trials, demonstrations at state and county farms and at northern substations, fertilizer demonstration tests, manure conservation, manufacture and distribution of tuberculin, hog cholera vaccine demonstrations, and potato spraying. The college has aided in developing farmers' cooperative projects, such as community breeders' associations, community potato centers, cooperative silo building circuits, and drainage service.

The general extension work includes young people's grain growing contests, bankers' pure-bred seed circuits, the dissemination of pure-bred seed grains, agricultural work in rural schools, tests of dairy cows, the Wisconsin dairy cow competition, butter and cheese scoring exhibitions, distribution of pure-culture starters, milk and cream testing, press service, lectures, correspondence, and educational exhibits. A map is given showing the distribution of extension lecture work. The extension instruction comprises university farmers' courses held in February for men, women, and boys, a country-life conference, state farmers' courses, one-week farmers' schools held at different places in the State, school garden work, and farmers' institutes.

MISCELLANEOUS.

Twenty-fourth Annual Report of Georgia Station, 1911 (*Georgia Sta. Rpt. 1911, pp. 125–138*).—This contains the organization list, reports by the president of the board of directors and by the director of the station on its work during the year, and a financial statement for the fiscal year ended June 30, 1911.

Twenty-fourth Annual Report of Maryland Station, 1911 (*Maryland Sta. Rpt. 1911, pp. XVIII+276, pl. 1, figs. 66*).—This contains the organization list, a report by the director on the work and expenditures of the station, a financial statement for the fiscal year ended June 30, 1911, and reprints of Bulletins 146 to 154.

Report of the director, 1911, H. L. RUSSELL (*Wisconsin Sta. Bul. 218, pp. 78, figs. 20*).—This contains the organization list, a report of the work of the station during the year, portions of which are abstracted elsewhere in this issue, brief summaries of the publications of the year, and a financial statement for the federal funds for the fiscal year ended June 30, 1911.

Monthly Bulletin of the Department Library, February and March, 1912 (*U. S. Dept. Agr., Library Mo. Bul., 3 (1912), Nos. 2, pp. 37–69; 3, pp. 73–110*).—These numbers contain data for February and March, 1912, respectively, as to the accessions to the Library of this Department and the additions to the list of periodicals currently received.

Experiment Station Work, LXVIII (*U. S. Dept. Agr., Farmers' Bul. 486, pp. 24, figs. 2*).—This number contains articles on the following subjects: The feeding of a grand champion steer and the utilization of dairy by-products as food.

NOTES.

Arizona University and Station.—The first state legislature has granted appropriations of $18,000 for the fiscal year which began July 1. These appropriations are for the maintenance of the date orchards, dry farming work, and farmers' institutes, and also provide for printing, repairs, and experimental work in horticulture.

The membership of the board of regents has been increased from six to nine, the personnel at present consisting of Governor G. W. P. Hunt, superintendent of schools C. O. Case, chancellor A. L. Waters, treasurer L. W. Wheatley, F. H. Hereford, and Dr. L. D. Ricketts.

E. Dana Trout has been succeeded as secretary of the station by C. C. Cable. C. N. Catlin has been appointed assistant chemist.

Connecticut College and Storrs Station.—The State Commission of Fisheries and Game is cooperating with the station in the breeding and rearing of quail and other game birds. The commission is furnishing funds with which to conduct the experiments, and the laboratory studies are being made at the station. The main problem under investigation at the present time is the quail disease which is responsible for the death of large numbers of the birds.

H. J. Bower, assistant in agronomy in Ohio State University, has been appointed assistant in agronomy in the college and station.

Illinois University and Station.—The honorary degree of doctor of laws has been conferred on Vice President T. J. Burrill, who is retiring under a pension from the Carnegie Institution after an active service of over forty years. A portrait of Jonathan B. Turner, well known as an early advocate of federal aid to agricultural education, has been unveiled in the Illinois Farmers' Hall of Fame.

Maine Station.—W. W. Bonns has resigned as associate horticulturist to become plant physiologist at the California Station, with headquarters at Riverside. George A. Yeaton has been appointed horticulturist, with headquarters at the station farm at Monmouth.

Mississippi Station.—Arthur F. Rolf has resigned as poultryman to become poultry husbandman at the Georgia Station, and entered upon his new duties July 20.

Missouri University and Station.—A chemical laboratory, to cost $60,000 and to be used mainly for agricultural chemistry, is under construction. It is to be known as Schweitzer Hall, in memory of Dr. Paul Schweitzer, who was connected with the department of chemistry for nearly forty years.

W. W. Wobus, assistant in dairy husbandry, has resigned to become instructor in dairy husbandry at the Iowa College. C. E. Wilson, assistant in veterinary science, has resigned to engage in commercial work in connection with the manufacture of hog-cholera serum. Three additional assistants have been appointed as follows: R. R. Hudelson in agronomy, O. C. Smith in agricultural chemistry, and T. T. Tucker in veterinary science.

Montana Station.—Harold H. Morris, instructor in chemistry in the Michigan College, has been appointed assistant chemist, and entered upon his duties July 1.

New Jersey College and Stations.—The appropriations made at the last session of the legislature include $100,000 for an agricultural building, $12,000 for a dairy building, $9,000 for the completion of the greenhouses, $3,000 for the completion of the poultry plant, $3,000 for roads and grading, and $2,000 for repairs and improvements in the short course building. Generous appropriations were also made for the maintenance of the poultry and horticultural departments, and the annual appropriation for the short courses was increased from $16,500 to $20,000. The mosquito extermination work was granted $25,000.

A new horse barn has been erected at the college farm, at a cost of about $8,000.

The fertilizer, feeding stuffs, and insecticide laws were revised at the last session of the legislature, and a new seed law was enacted. John P. Helyar has been appointed seed analyst of the station.

Other appointments include, in the college, Dr. M. T. Cook as professor of plant pathology and Earle C. Stillwell as instructor in horticulture; and in the station, Arthur L. Zimmerman as fertilizer sampler, L. A. Ruzicka as greenhouse assistant, and A. L. Clark as assistant poultry husbandman. Dr. William D. Hoyt, instructor in botany, and Ray G. Voorhorst, instructor in horticulture, have resigned.

New Mexico College and Station.—The state legislature has recently appropriated $30,000 for a new building, which will probably be used for the erection of a fireproof science hall. The regular state appropriation for maintenance has been increased to $25,000 per annum.

W. H. Cunningham has been appointed assistant in animal husbandry, in charge of dairying. S. E. Merrill has resigned as assistant in horticulture.

Cornell University and Station.—Dr. Clyde Hadley Myers has been appointed assistant professor of plant breeding, to have general charge of the extension work in that subject, and Dr. Rhett Youmans Winters has been appointed instructor in plant breeding, to give special attention to the teaching. C. S. Wright and G. J. Burt have resigned as assistants in olericulture and floriculture, respectively, to engage in commercial work.

North Carolina College and Station.—Dr. Burton J. Ray, who has been instructor in chemistry in the college and assistant chemist in the station, will hereafter devote his entire attention to station work. T. B. Stansel, assistant chemist in the station, and F. W. Sherwood, instructor in chemistry in the college, have resigned to undertake graduate work at Cornell University, and will be succeeded respectively by N. G. Fetzer and F. B. Sherwood, both 1912 graduates of the college. John W. Nowell, Ph. D. (Johns Hopkins 1912), has been appointed to an additional instructorship in chemistry.

Ohio Station.—J. T. Rogers, Leo E. Melchers, and E. L. Nixon have been appointed assistants in the department of botany. Charles M. Fritz has been appointed assistant in the department of nutrition, vice R. C. Collison, who has accepted a position at the New York State Station.

Texas College and Station.—The main building, erected in 1876 at a cost of $100,000, was destroyed by fire May 27. It contained the administrative offices, library, and class rooms for three departments.

H. L. McKnight has been succeeded as superintendent of the station farm by R. E. Dickson, a 1912 graduate of the college.

Utah College and Station.—At the annual meeting of the board of trustees, Dr. F. S. Harris was made director of the school of irrigation engineering. The scope of the school was somewhat enlarged, and Ray B. West appointed professor of agricultural engineering in addition to the present staff. The discontinuance of the preparatory courses in the college at the close of the next academic year was authorized.

Dr. Robert Stewart has been appointed to the newly established position of assistant director of the station; W. E. Carroll has been appointed assistant director of the school of agriculture. H. J. Webb, Howard Sweitzer, and C. L. Merrill, all 1912 graduates of the college, have been appointed assistants respectively in entomology, horticulture, and agronomy. Stephen Boswell, superintendent of the Nephi Farm, and F. Froerer, assistant in animal husbandry in charge of the cooperative cow-testing work, have resigned to engage in commercial work, and have been succeeded respectively by A. D. Ellison and John Wilson, both 1912 graduates of the college.

Virginia Truck Station.—L. L. Corbett has resigned as assistant in truck crops to accept a position with the Farm Management Investigations of this Department.

Washington College and Station.—At a recent meeting of the board of regents plans for a $150,000 building, to be used jointly by the station and the departments of agriculture, horticulture, and extension work of the college, were authorized.

A department of extension work has been definitely organized in the college, in place of the former work in farmers' institutes and agricultural extension. The new department has been placed temporarily under the supervision of the head of the department of agriculture of the college, with R. C. Ashby, superintendent of farmers' institutes, in general charge of the details of the work. The completion of a staff of extension workers will proceed as rapidly as circumstances will permit.

Dr. H. B. Humphrey, plant pathologist of the station, has been made vice director, the appointment becoming effective July 1. N. Rex Hunt has resigned as assistant botanist of the station, and C. D. George, a 1912 graduate of the college, has been appointed assistant plant pathologist.

Wisconsin University and Station.—A four-day university exposition was held in May at which the agricultural work was prominently represented. A course in beekeeping is to be added to the curriculum with the new college year.

Three county representatives of the station have now been appointed, namely, F. D. Otis in Barron County, E. L. Luther in Oneida County, and G. R. Ingalls in Eau Claire County. A state appropriation of $1,000 and a county appropriation of $500 are available in each case. The work to be undertaken will include instruction in the county training school for teachers, and in farmers' courses, lectures, and demonstration work with farmers, and cooperation with individuals.

The station is to undertake the manufacture and distribution of hog-cholera serum. A new office building, foreman's cottage, fireproof seed vault, and barns are under construction at the Ashland substation.

Dr. B. H. Hibbard, professor of economics and political science at the Iowa College, has been appointed associate professor of agricultural economics.

Prospective Agricultural Meetings.—The Association of American Agricultural Colleges and Experiment Stations will hold its twenty-sixth annual convention at Atlanta, Ga., November 13 to 15; the American Association of Farmers' Institute Workers will also meet at Atlanta, November 11 to 13.

The twenty-ninth annual convention of the Association of Official Agricultural Chemists will be held at Washington, D. C., September 16 to 18.

EXPERIMENT STATION RECORD.

VOL. XXVII. AUGUST, 1912. NO. 2.

The fifth session of the Graduate School of Agriculture was held at the Michigan Agricultural College, East Lansing, Mich., July 1 to 26. As heretofore, the school was under the general management of the Association of American Agricultural Colleges and Experiment Stations, through its standing committee on graduate study. The financial support of the school was derived from the contributions of many of the colleges represented in the association, the matriculation fees of the students, and the funds of the Michigan Agricultural College. This institution, through its president and trustees, generously assumed responsibility for the maintenance of the school. President Snyder, Secretary Brown, Dean Shaw, and other members of the faculty made the local arrangements for the sessions and otherwise contributed in many ways to its success. The lectures and seminars were largely held in the great Agricultural Building, admirably adapted for the purpose, but the Bacteriological and Entomological buildings were also used. The lecturers were very pleasantly housed in the spacious Woman's Building, where Dean Gilchrist and her associates in the home economics department did much to make their stay at the college very agreeable; other buildings, libraries, and other equipment of the college were placed at the disposal of the school. The extensive field experiments, the botanic garden, and the many varieties of trees on the beautiful campus furnished much of interest for observation. Dr. A. C. True, Director of the Office of Experiment Stations, served as dean, as at the previous sessions, and Secretary A. M. Brown, of the Michigan College, acted as registrar.

Courses of study were offered in the following lines: Soils and plant physiology, animal physiology, agronomy, horticulture, beef and dairy cattle, swine and poultry, rural engineering, and rural economics, including farm management. As at previous sessions, the hours were so arranged that all interested in plants could attend the course in soils and plant physiology, and those interested in animals the course in animal physiology, and these courses dealt more particularly with fundamental topics considered from the standpoint

of both pure and applied science. The other courses were so arranged that the students naturally divided into smaller groups along the lines of their chief special interests.

The faculty numbered forty-eight, in addition to six speakers at special conferences on general questions relating to agricultural education and research. It included seven officers of the U. S. Department of Agriculture, fifteen members of the faculty of the Michigan Agricultural College, and eighteen professors and experts from fourteen other agricultural colleges and experiment stations. In addition, lecture courses and seminars were given by Dr. T. N. Carver, professor of economics of Harvard University; Dr. H. C. Sherman, professor of food chemistry, Columbia University; Dr. L. B. Mendel, professor of physiological chemistry, Yale University; Dr. Oscar Riddle, research associate of the Carnegie Institution of Washington; and H. N. Ogden, professor of sanitary engineering, Cornell University.

Many interesting and valuable matters were also brought out from an international viewpoint in the lectures given by Dr. E. J. Russell, Director of the Rothamsted Experiment Station, England; Dr. F. H. A. Marshall, professor of agricultural physiology, Cambridge University, England; and Dr. Oscar Loew, of the Hygienic Institute, Munich, Germany.

The total enrollment of students at the close of the session was one hundred and eighty, including forty-one women, who were also enrolled in the Graduate School of Home Economics. This latter school was under the general management of the American Home Economics Association, and for the first time prolonged its session to cover four weeks. As heretofore it was conducted in close affiliation with the Graduate School of Agriculture. The students in both schools came from thirty-four States and Porto Rico, Canada, Russia, China, and Japan.

The public opening exercises were held on the evening of July 3 in the auditorium of the Agricultural Building of the college, and were well attended. Dr. H. P. Armsby, chairman of the committee on graduate study of the association, presided and made an introductory address. An address of welcome was made by President Snyder on behalf of the Michigan Agricultural College. Dean R. S. Shaw, of the agricultural division of this college, spoke on the leading features of Michigan agriculture. Dean Maude Gilchrist, of the home economics division, spoke on the work of the Graduate School of Home Economics. Dean True, of the Graduate School of Agriculture, gave a brief summary of the history of the school during the decade of its existence, and pointed out in a general way the development of American agriculture and agricultural education and research during that period. The substance of his remarks on the latter topic are as follows:

The main objects of the school have been to arouse interest in graduate study and to stimulate a keener sense of the needs and requirements of such work by bringing graduate students for a brief time under the direct influence and inspiration of leading teachers and investigators in different branches of agricultural and related sciences. There can be no doubt that this school has exerted considerable influence in promoting the establishment of graduate courses in agriculture in a number of institutions. It is also believed that it has done much toward creating more favorable conditions for serious study and research along agricultural lines in our whole system of agricultural colleges and experiment stations. And through its conferences on pedagogical and other questions relating to the broader aspects of agricultural education it has aided in the wider diffusion of agricultural knowledge through the lower schools and extension agencies.

In the decade during which the Graduate School of Agriculture has been in operation the movement for agricultural education in the United States has been greatly broadended and strengthened. Comparing very briefly the statistics of 1901 with those of 1911 (the latest available), we may get some indication of the growth of our agricultural institutions during this period. The permanent funds and equipment of the land-grant colleges have increased from $67,000,000 to $120,000,000 and their income from $7,000,000 to $22,000,000. The total number of students has increased from 42,000 to 84,000, and of agricultural students from 7,000 to 16,000.

In 1901, 2,000 farmers' institutes were held in the United States, with an attendance of 500,000; in 1911 there were 6,000 institutes, with an attendance of 2,500,000, to which may be added 1,000,000 persons who attended the lectures given in connection with special railroad trains and other forms of extension work.

Meanwhile there has been a remarkably rapid introduction of agriculture into the secondary schools. Within the past two years the number of institutions of secondary grade giving courses in agriculture has risen from 700 to 2,300.

Within the past ten years experimental and research work in agricultural lines has also greatly increased. In 1901 the experiment stations had an income of $1,232,000, as compared with $3,615,000 in 1911; and the membership of their staffs increased from 688 to 1,587. In the middle of this period the Adams Act was passed, which has already done very much to set in operation higher researches on agricultural problems.

It is interesting to note the increase in some lines of research—the number of chemists increasing from 146 to 293; botanists from 49 to 84; mycologists and bacteriologists from 21 to 60; entomologists from 48 to 108; horticulturists from 78 to 131; animal husbandmen

from 14 to 101; and dairymen from 31 to 77. Great advance in specialization is also shown in the following, who did not appear at all in the 1901 statistics of the stations but were given in 1911: Agronomists 139; plant breeders 12; soil specialists 34; plant pathologists 54; foresters 22; poultrymen 32; and agricultural engineers 21.

Meanwhile the financial interests involved in American agriculture have grown enormously. Land values have more than doubled and aggregate nearly thirty billions of dollars; total values of farm property have also doubled and aggregate over forty billions of dollars. The total value of the agricultural products of the United States for the twelve years ending in 1910 was seventy-nine billions of dollars.

The number of our farms has increased only ten and five-tenths per cent, but they aggregate 6,340,000; the farm population has increased very slowly, but there are thirty million people on our farms.

We are just awakening to the vast significance of the human and material problems involved in the development of our agriculture. Attention is just now focused on the rapid spread of the movement for popular education in agriculture. But those who stand closest to this great movement and realize most fully what it means, know also that there never was a time when wise leadership and sound and deep knowledge in agricultural matters were so much to be desired as to-day. The period of propaganda to convince the rural people of the desirability of agricultural education and research is nearly over. What is especially needed now is wise and well-educated leadership in order that the great movement under way may be efficiently organized and guided in right channels. Thoroughly trained investigators, teachers, and administrators are needed in constantly increasing numbers, and the supply is far below the demand. The importance of such conferences along the higher ranges of agricultural work as this Graduate School is greater than ever before and we ought to pursue our work here with the greatest enthusiasm and seriousness, in the hope that our meeting together will help to strengthen the forces which are seeking to guide public sentiment in right channels of thought and activity for agricultural advancement and to disseminate useful and sound knowledge on agricultural subjects among great numbers of students in our agricultural institutions and among the masses of our rural people throughout the United States.

The courses in soils and plant pathology, animal physiology, and rural economics, including farm management, were very strong and attractive. The problems of the soil were discussed in their physical, chemical, and biological aspects and from many points of view. Dr. Schreiner, of the Bureau of Soils, discussed the organic soil

constituents and their effect on plant growth, and summarized his own recent investigations on the biochemistry of soils. Professor Patten, of the Michigan Agricultural College, presented the chemical status of soil phosphorus, and his associate, Mr. Robinson, discussed the chemistry of humus. Dr. Headden, of the Colorado Agricultural College, described the peculiar characteristics of Colorado soils and gave the results of his investigations on the problems of alkali and nitrates in those soils; Dr. E. J. Russell treated the production of plant food in the soil, with special reference to the Rothamsted investigations on the effect of partial sterilization on the soil organisms. Professor Jeffery, of the Michigan College, discussed various factors affecting the functioning of soils, and his associate, Dr. Bouyoucos, showed the radiating power of soils under various conditions. Dr. Bizzell, of Cornell University, presented some of the results of investigations by Dr. Lyon and himself on the problems of nitrification and the colloidal matter in soils; Dr. Duggar, of the same institution, dealt with the rôles of mineral nutrients in plant metabolism and the fixation of nitrogen by soil organisms. Dr. Oscar Loew, of the Hygienic Institute, Munich, Germany, discussed the rôle of mineral nutrients in animals and plants, especially in regard to lime and magnesia.

In the course in animal physiology, Dr. Mendel discussed some of the problems in the biochemistry of nutrition, and summarized the newer researches on nutrition in growth and maintenance; Dr. Sherman treated the functions of food and of the digestive ferments and the utilization of specific food materials; and Dr. Forbes, of the Ohio Experiment Station, dealt with the mineral elements in animal nutrition. Dr. C. E. Marshall, of the Michigan Agricultural College, and his associates, Messrs. Brown, Giltner, Rahn, and Van Suchtelen, discussed the biology of the cell. Dr. Riddle's lecture had to do with the phenomena of development, with special reference to color characters and the physiological basis of sex. The significance and origin of sex differentiation and the inheritance of sex were discussed by Dr. Pearl, of the Maine Experiment Station. Mr. Morse, of this Office, dwelt especially on the importance of the application of physiological methods to live stock investigations and instruction.

In rural economics, Dr. Carver laid special stress on the economizing of human energy and of land in the rural industries, and the general problems connected with the maintenance of the efficiency of the rural population. Mr. Galpin, of Wisconsin University, emphasized the social factors of the rural community; Dr. Hedrick, of the Michigan College, spoke on human ecology; Dr. Warren, of Cornell University, described the methods of making agricultural

surveys, and gave many interesting illustrations drawn from his work in New York with reference to the size and character of farms as related to their productiveness and financial returns. Messrs. C. B. Smith and E. H. Thomson, of the Farm Management Division of the Bureau of Plant Industry, described the methods pursued in farm management field studies and demonstrations, and discussed farm organization and labor and the factors affecting profits in farming in the corn belt.

In the course in rural engineering, lectures were given on drainage by Professor Stewart of Minnesota, roads by Dr. Hewes of the Office of Public Roads, irrigation in humid regions by Mr. Williams of this Office, rural sanitation by Professor Ogden of Cornell University, and farm mechanics by Professor Davidson of Iowa State College. During the last week of this course important conferences on the scope and methods of instruction in rural engineering in the agricultural colleges were held by a number of the heads of such departments in different institutions.

Eight interesting conferences on the principles of general and agricultural research, the scope, aim, and methods of college and secondary instruction in agriculture and of extension work along this line were held under the leadership of Dean Hunt of Pennsylvania State College, Professor Coulter of the University of Chicago, Dean Russell of the Wisconsin College of Agriculture, Professor Tuck of the New York State College of Agriculture, Professor Christie of Purdue University, Professor French of Michigan Agricultural College, and Dean True.

Meetings of the International Association of Poultry Instructors and Investigators, the Association of Official Dairy Instructors, and the American Society of Agronomy were held before or during the session of the Graduate School of Agriculture, as well as the annual conclave of the Alpha Zeta Fraternity. Excursions were made to peppermint and other farms in the vicinity of Lansing. Receptions to the school were given by President and Mrs. Snyder at their home, and by Dean Gilchrist at the Woman's Building.

Much high-grade work was done at this session of the Graduate School of Agriculture, and the discussions covered a wide range. It is believed that the three hundred persons who came in contact with this school as lecturers, students, or visitors gave and received much of value as inspiration to better teaching and investigating, and that the results of this session will be widely felt in our agricultural institutions.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Handbook of biochemical methods, edited by E. ABDERHALDEN (*Handbuch der Biochemischen Arbeitsmethoden. Berlin and Vienna, 1912, vol. 5, pt. 2, pp. XV+673–1467, pl. 1, figs. 139*).—This portion of the work deals with the detection of poisons by chemical methods, the transplantation of tissues, the technique of cultivating tissues in vitro, methods for the biochemical examination of the soil, methods for metabolism tests with micro-organisms, the gasometric determination of primary aliphatic amino-nitrogen and its use for physiological-chemical investigations, the analysis of proteins for determining the characteristic groups of various amino acids, the Zuntz method of gas analysis, new apparatus for metabolism experiments, ash analysis, ultra-filtration, tables for the preparation of solutions with definite hydrogen ion concentrations, methods for biological micro-analysis, methods for studying intermediary metabolism, methods for the biochemical study of plants, quantitative micro-elementary analysis of organic substances, capillary analysis, biochemical and chemotherapeutic methods for trypanosomes, and reagents for detecting the more important biological compounds.

An introduction to the chemistry of colloids, V. POSCHL, trans. by H. H. HODGSON (*London, 1910, pp. 114*).—An English edition of the German work previously noted (E. S. R., 24, p. 120).

Introduction to colloid chemistry, V. POSCHL (*Einfuhrung in die Kolloidchemie. Dresden, 1911, 3. ed. rev., pp. 80*).—A third edition of the work above referred to.

Physical chemistry of the cell and tissue, R. HÖBER (*Physikalische Chemie der Zelle und der Gewebe. Leipsic, 1911, 3. ed., pp. XV+671, figs. 55; rev. in Biol. Centbl., 32 (1912), No. 4, pp. 243–250*).—A third revised and enlarged edition of this work on physical chemistry as applied to physiological problems.

Chemistry of the cell, W. J. GIES ET AL. (*Biochem. Bul., 1 (1911), No. 1, pp. 65–93*).—These are abstracts of communications to a symposium on the chemistry of the cell, held at Columbia University, including intracellular water, salins, carbohydrates, lipins, proteins, extractives, and enzyms, and factors in immunity.

In regard to the chemistry of chlorophyll, M. S. TSVETT (*Rev. Gén. Sci., 23 (1912), No. 4, pp. 141–148*).—This article gives a general view of the present status of the chemistry of chlorophyll.

Yearbook of chemistry, edited by R. MEYER (*Jahrb. Chem., 20 (1910), pp. XII+568*).—This is a report of the more important progress made in the field of pure and applied chemistry for the year 1910.

Investigations in regard to the precipitation of proteins, A. J. J. VANDEVELDE (*Bul. Soc. Chim. Belg., 25 (1911), No. 4, pp. 166–173*).—Continuing previous work (E. S. R., 25, p. 709), the author now reports further results of

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experiments in precipitating fractionally by various methods proteins from cow's milk, colostrum, equine and bovine serum, and hen's eggs. Some proteins were redissolved and precipitated.

The results bring out the fact that the transformation of one protein into another is not uncommon, and furthermore that the transformations which do occur include changes in regard to their precipitation with reagents and temperature of coagulation.

The synthesis of fats by the action of enzyms, F. L. DUNLAP and L. O. GILBERT (*Jour. Amer. Chem. Soc., 33 (1911), No. 11, pp. 1787–1791*).—Previously noted from another source (E. S. R., 26, p. 307).

The variations in the phosphorus content of seeds under varying vegetative conditions, MLLE S. LEWONIEWSKA (*Bul. Internat. Acad. Sci. Cracovie. Cl. Sci. Math. et Nat., Ser. B, 1911, No. 2, pp. 85–96*).—The variation in the total phosphorus and nitrogen content of oat seeds was found to be due chiefly to the vegetative conditions, and the variety of seed employed had practically no relation to these constituents. The greatest variation was in the case of the phosphorus compounds soluble in 1 per cent acetic acid solution, namely, inorganic phosphorus and phytin, with little variation for protein and lecithin phosphorus.

Plants which received a goodly supply of phosphorus showed 2, 3, and 4 times more inorganic and phytin phosphorus than those which received phosphorus sparingly. From this it follows that plants receiving scant amounts of phosphorus will yield seeds which have appropriated much of the phosphorus for the production of nuclein compounds, while those plants having a good supply of phosphorus to draw upon will show a larger storage of phosphorus as inorganic combinations and phytin in the mature seed. The variation in the nitrogen content of the seeds was far greater than that of the phosphorus, and the protein nitrogen showed a greater fluctuation than the nonprotein nitrogen. The reason for this variation was not apparent to the author. It is believed that by determining in the seed the phosphorus soluble in 1 per cent acetic acid a better index can be obtained as to the assimilable phosphorus in the soil than by determining the nitrogen-phosphorus ratio of the seed.

In regard to the action of phosphates upon the activity of proteolytic ferments, N. N. IWANOW (*Trudy Imp. S. Peterb. Obshch. Estestvo. (Trav. Soc. Imp. Nat. St. Petersb.), 42 (1911), III, No. 2–8, pp. 225–238*).—It was found that potassium acid phosphate (KH_2PO_4) accelerates the autolysis of proteins in yeast extract (befanol). This activity was found to increase to a certain point when the phosphate content was increased (from 0.38 to 1.52 per cent), and was dependent upon the temperature and the amount of protein present, but independent of a preexisting fermentation of saccharose. In all instances it was found that no total solution of the protein took place, and only 16 per cent dissolved when 1.52 per cent of phosphate was present. In water, as well as in a 5 per cent saccharose solution, the cleavage was accelerated by neutral phosphates at various temperatures, but the action was retarded by alkaline phosphates (K_2HPO_4).

Some observations upon the assay of digestive ferments, H. T. GRABER (*Jour. Indus. and Engin. Chem., 3 (1911), No. 12, pp. 919–921*).—The results show "that the composition of the white of the egg, chemically and probably even physically, when used for the assay of pepsin, has a great bearing upon the apparent strength of this ferment. The albumin seems to be more difficult to digest the first 24 hours after the egg is laid and a change gradually takes place until after about 5 to 7 days it has reached its maximum solvent condition. After this period its digestibility gradually diminishes.

"In the assay of pancreatin for starch hydrolysis, as well as all the diastasic ferments, the kind of starch used is of prime importance and in stating the strength of each it should be in terms of the particular starch employed."

In tests with papain it was found to make very little difference what kind of raw beef was used when the ferment was acting in acid media, but if the nature of the beef was changed (for instance, by cooking) papain was found to lose its solvent action. Rennet was found to be influenced in its coagulating power by the chemical composition of the milk as regards the presence and amount of inorganic salts, particularly calcium salts. The mixing of the rennet with the milk, the temperature at which the milk was kept before and during the test, and finally the breed of cows from which the milk was obtained were additional factors.

Action of the salts of the gold group upon the saccharification of starch by amylolytic ferments, C. GERBER (*Compt. Rend. Soc. Biol. [Paris], 70 (1911), No. 13, pp. 547–553*).—This is a continuation of the studies previously noted (E. S. R., 25, p. 107) with the salts of this group as to the hydrolysis of starch. Zinc chlorid acidulated with hydrochloric acid, potassium oxalate acidulated with oxalic acid, copper chlorid, and the various chlorids of gold and platinum were employed. Some tests upon the coagulation of milk with these chemicals are also included.

Action of the salts of the alkali metals upon the saccharification of starch by amylolytic ferments, C. GERBER (*Compt. Rend. Soc. Biol. [Paris], 70 (1911), No. 10, pp. 391–397*).—The author reports his results with the salts from inorganic, monobasic acids (chlorids, nitrates, and fluorids of sodium, potassium, and ammonium), the salts of dibasic acids (sodium sulphate and bisulphate), and those from tribasic acids (tri-, di-, and monopotassium orthophosphates). Experiments were also made with the organic salts of monobasic organic acids from the aliphatic and aromatic series (sodium formate, acetate, butyrate, propionate, valeriate, stearate, palmitate, benzoate, and salicylate), and salts of the polybasic acids (potassium and sodium oxalate and citrate).

Action of some salts upon the saccharification of Fernbach and Wolff's soluble starch by amylolytic ferments, C. GERBER (*Compt. Rend. Soc. Biol. [Paris], 71 (1911), No. 27, pp. 247–249*).—This work was done with the chlorids of cadmium, bichlorid of mercury, zinc chlorid, cupric chlorid, silver nitrate, potassium oxalate, sodium citrate, and quinin hydrochlorate.

In regard to catalase, GRIMMER (*Milchw. Zentbl., 7 (1911), No. 7, pp. 314–316*).—A discussion in regard to the findings of W. D. Kooper (E. S. R., 26, p. 112) with the various forms of apparatus for determining the catalytic activity of milk.

The examination of substances important in agriculture and the industries, J. KÖNIG (*Die Untersuchung landwirtschaftlich und gewerblich wichtiger Stoffe. Berlin, 1911, 4. ed. rev., pp. XX+1226, figs. 426*).—This is the fourth edition of this work (E. S. R., 17, p. 1133).

A quantitative method for determining small amounts of potassium, E. A. MITSCHERLICH, K. CELICHOWSKI, and H. FISCHER (*Landw. Vers. Stat., 76 (1912), No. 1–2, pp. 139–155*).—The method which follows is recommended for determining small amounts of potassium in soil extracts which are obtained by extracting soil with water, saturated with carbon dioxid, and any other material containing potassium.

To 250 cc. of the soil solution in a beaker, 5 cc. of concentrated nitric acid and 5 drops of dilute (1:3) sulphuric acid are added, and the whole concentrated to a bulk of 20 cc. The concentrated solution is transferred quantitatively to a platinum or quartz dish, evaporated to dryness, and the organic matter destroyed by heating the dish for a short time.

The residue is taken up with 1 drop of a concentrated sodium carbonate solution, free from potassium, and a few cubic centimeters of warm water. The solution is evaporated and the residue heated until fusion of the sodium carbonate has taken place. The cooled residue is approximately neutralized with nitric acid, and any free acid which remains must be removed by evaporation. The residue from this is then dissolved in about 5 cc. of hot water and treated with 3 cc. of a 10 per cent cobalt chlorid solution and about 5 cc. of a 10 per cent sodium nitrite solution. After this the solution is evaporated to dryness slowly (shaking occasionally during the process to avoid crust formation) at a temperature of from 80 to 90° C., and when cooled 3 cc. of a 10 per cent acetic acid is added to dissolve the excess of sodium cobaltic nitrite.

On solution of the crust 10 cc. of water is added, and the crystalline residue which remains is transferred to a Gooch crucible which holds a disc of hardened filter paper. The precipitate on the filter is washed with small amounts of a 2½ per cent solution of sodium sulphate. To the crucible and washed residue contained in a beaker about 20 cc. of fiftieth-normal potassium permanganate and 100 cc. of water are added, and the beaker and its contents is placed in a water bath, the temperature of which is then gradually raised to the boiling point. The beaker is shaken occasionally during the interim. If manganese superoxid separates out, 25 cc. of dilute sulphuric acid is added drop-wise. When the yellow precipitate on the filter has dissolved the beaker is removed from the water bath and an excess of fiftieth-normal oxalic acid solution is added, and the excess of oxalic acid is titrated with fiftieth-normal potassium permanganate solution (1 cc.=0.0001571 gm. of potassium oxid).

This method can also be used for examining material containing large quantities of potassium.

An improved Hollemann method for estimating phosphoric acid, E. Vitoria (*Chem. Ztg., 35 (1911), No. 123, p. 1152; abs. in Analyst, 36 (1911), No. 429, p. 605*).—"When a superphosphate is boiled for a few hours in a cold saturated solution of ammonium nitrate, almost the whole of the phosphoric acid goes into solution. About 2 gm. of the superphosphate, finely ground and dried at 115 to 120° C., are vigorously boiled for about 10 hours with 100 to 150 cc. of ammonium nitrate solution, 10 cc. of sodium acetate solution, and 500 cc. of water; the water lost by evaporation is replaced from time to time, and the liquid is finally made up to 1 liter. Forty cc. of this solution are made slightly alkaline with sodium hydroxid and shaken with 20 cc. of tenth-normal silver nitrate solution; the silver phosphate is filtered off rapidly, and the excess of silver in the filtrate is titrated according to Volhard's method."

Neutral ammonium citrate solutions, A. J. Patten and C. S. Robinson (*Michigan Sta. Rpt. 1911, pp. 173–178, figs. 2*).—The work here reported has been previously noted (E. S. R., 26, p. 98). See also an article by Hall (E. S. R., 26, p. 109).

The use of Busch's "nitron" for the determination of nitrate nitrogen in soils and fertilizers, C. S. Robinson and O. B. Winter (*Michigan Sta. Rpt. 1911, pp. 178–181*).—The authors conclude that "the 'nitron' method [E. S. R., 16, p. 945] seems to be generally inapplicable to the determination of nitrate nitrogen in soils but can be used to advantage in the determination of this form of nitrogen in fertilizers. The reason for its failure in the case of soils is the presence of organic matter which either contaminates the precipitate or holds it up."

Practical hints for determining the hygroscopicity of soils by the Rodewald-Mitscherlich method, G. von Romberg (*Landw. Vers. Stat., 75 (1911), No. 5–6, pp. 483, 484*).—This deals with some points in regard to the evacua-

tion and influx of air during the desiccation of soils with the aid of phosphorus pentachlorid.

A simple method for determining the mineral substances in water and another for estimating the hardness of drinking and industrial waters, WUNDER (*München. Med. Wchnschr., 58 (1911), No. 49, pp. 2611–2613, fig. 1*).—The method consists in measuring in milliamperes the amount of a constant current passing through a definite amount of water. The figure obtained is a definite index to the amount of mineral substance present. The hardness of the waters is determined by a solution of lysol, a soapy emulsion of cresols.

A simple method for detecting and estimating the nitrites and nitrates in water, J. TILLMANS and W. SUTTHOFF (*Ztschr. Analyt. Chem., 50 (1911), No. 8, pp. 473–495*).—The chief advantages of this modified method for determining nitrates and nitrites with diphenylamin-sulphuric acid (E. S. R., 25, p. 14) are as follows: (a) The rapidity and simplicity with which the method can be carried out, because it requires no special form of apparatus; (b) only a few cubic centimeters of water are necessary for the test, even when small amounts of nitrites or nitrates are present. One-tenth mg. of nitrous and nitric acids per liter can be determined with accuracy.

A rapid preliminary test for detecting added water to milk, J. TILLMANS (*Molk. Ztg. Berlin, 22 (1912), No. 4, pp. 39, 40; Chem. Ztg., 36 (1912), No. 10, p. 81*).—The author calls attention to the value of the diphenylamin-sulphuric acid reagent for detecting added water in milk.

The determination of saccharose and the detection of dextrin in some food products, A. F. VOLLANT (*Ann. Falsif., 4 (1911), No. 36, pp. 504–509*).—Lemeland's method (E. S. R., 24, p. 611) can be used for commercial sugars, sirups, comfits, dried milk, and honey. As dextrin is not attacked to any great extent by this procedure, the method can be employed with the aid of the polariscope for detecting this substance in foods.

Constants of chicken and turkey fats, R. Ross and J. RACE (*Analyst, 36 (1911), No. 422, p. 213*).—A number of constants are given, as follows:

Constants for fat and fatty acids of chicken and turkey fat.

Constants.	Fat.		Fatty acids.	
	Chicken.	Turkey.	Chicken.	Turkey.
Specific gravity at 100° F	0.9065	0.9090	0.8866	0.8990
Koettstorfer value	204.6	191.6	208.3	195.0
Molecular weight			270.0	287.0
Iodin value (Wijs)	71.5	66.4	73.6	70.7
Reichert-Meissl value	1.8	3.8		
Polenske number	2.1	1.6		
Acetyl value			25.4	18.4
Ricinoleic acid, per cent			13.7	9.9
Hehner value	94.6	95.1		
Melting point, ° C	23 to 27	31 to 32	27 to 30	37 to 38
Zeiss number at 50° C	47.5	46.0	36.5	32.5

"The fats were optically inactive. An examination of the fat from fowls which had died of overfeeding invariably showed a higher Zeiss number and iodin value than the normal values given above. This result is generally brought about by the use of too much heating food."

Determination of gliadin or alcohol-soluble protein in wheat flour, R. HOAGLAND (*Jour. Indus. and Engin. Chem., 3 (1911), No. 11, pp. 838–842*).—The chief differences in the methods used for the determination of gliadin in wheat flour lie in the strength of the alcohol employed and in methods of extraction.

It was found in this work that alcohol of the strength of 45 to 55 per cent by weight will extract all the alcohol-soluble nitrogen, or gliadin, present in wheat flour. A 75 per cent solution (by weight) of alcohol will extract the same amount of protein as distilled water.

Much confusion exists in the literature as to whether the amount of alcohol usually recommended is 70 per cent by weight or volume. If considered on the basis of volume this is equivalent to practically 62.5 per cent by weight.

The method used by the author is as follows: "Weigh approximately 2 gm. of flour into an 8-oz. milk sterilizer bottle, add 100 cc. neutral 50 per cent by weight alcohol; shake in machine for 1 hour, centrifuge for 10 minutes, filter, determine nitrogen in aliquot portion of filtrate by modified Kjeldahl method. Correction is always made for a blank determination run with alcohol, etc. In using a shaking machine it is, of course, necessary to have the bottles shaken vigorously so that the flour will remain in suspension. The use of the centrifuge makes filtration easy, which would otherwise be rather slow, due to fine flour particles in suspension."

The testing of the quality of gliadin in flour, J. Apsit and Brocq-Rousseu (*Ann. Sci. Agron., 3. ser., 6 (1911), II, No. 2, pp. 81–86, figs. 2*).—A description of an apparatus for determining the quality of the gliadin in wheat flour, and which is said to have none of the disadvantages of the Boland and other apparatuses used for this purpose.

In regard to the acids in honey, A. Heiduschka (*Chem. Ztg., 35 (1911), No. 118, pp. 1104, 1105*).—This is a continuation of the work previously reported (E. S. R., 26, p. 25), and includes determinations of the total acidity, total volatile acids, formic acid according to the mercurous-chlorid and carbon monoxid methods, and lactic, malic, and phosphoric acids. Citric and succinic acids could not be detected with certainty. Free acids from the wax or higher fatty acids were noted.

The differentiation of almonds from similar seeds, E. Hannig (*Ztschr. Untersuch. Nahr. u. Genussmtl., 21 (1911), No. 10, pp. 577–586, figs. 9*).—A description of the histological characteristics of almonds, and of peach, plum, apricot, and similar stones.

Determination of malic acid, P. B. Dunbar and R. F. Bacon (*Jour. Indus. and Engin. Chem., 3 (1911), No. 11, pp. 826–831*).—This has been previously noted from another source (E. S. R., 25, p. 715).

The immersion refractometer as a rapid means of approximating the solids in vinegar, R. E. Remington (*North Dakota Sta. Spec. Bul., 2 (1912), No. 3, pp. 40, 41*).—Immersion refractometer readings were taken on a series of commercial vinegars, using the undiluted vinegar and at a temperature of 17.5° C. The amount of volatile acid, as acetic acid, was also determined, and the reading for acetic acid solution of this strength, calculated from Wagner's table, subtracted from the reading obtained on the original vinegar. The resulting difference was supposed to be due to the amount of solids present, and an attempt was made to determine this relationship.

The results obtained failed to disclose any marked peculiarity in the solids of cider vinegar, but the author is of the opinion from the abnormalities shown that a large number of determinations on authentic samples of cider vinegar may yield a factor characteristic of this substance.

A method for the detection of small quantities of coumarin, particularly in factitious vanilla extracts, H. J. Wichmann (*U. S. Dept. Agr., Bur. Chem. Circ. 95, pp. 2*).—The method which is proposed is based on the principle that when fused with potassium hydroxid vanillin will yield the potassium salt of protocatechuic acid, and coumarin will yield potassium salicylate. The method is as follows:

"Slightly acidify 25 cc. of the extract, if alkaline, with sulphuric acid, add 25 cc. of water, and distill to dryness. To the distillate, containing the vanilla and coumarin, add 15 to 20 drops of 1:1 potassium hydroxid, hastily evaporate the distillate to 5 cc., and transfer to a test tube. Heat the test tube over a free flame until the water completely evaporates and the residue fuses to a colorless, or nearly colorless mass. The reaction previously described will have occurred. Cool the melt and dissolve in a few cubic centimeters of water. Transfer the solution to a 50 cc. Erlenmeyer flask and acidify slightly with 25 per cent sulphuric acid. The amount of solution should not be over 10 cc. Finally distill the solution into a test tube containing 4 or 5 drops of neutral 0.5 per cent ferric sulphate or ferric chlorid. If coumarin is present in the original extract, an amethyst or purplish color will develop, the intensity being directly proportional to the amount of coumarin present.

"Vanillin and other normal constituents of vanilla extract do not interfere with the method."

The estimation of furfurol by means of Fehling's solution, L. Eynon and J. H. Lane (*Analyst, 37 (1912), No. 431, pp. 41–46*).—A series of experiments was conducted with Flohil's method, previously noted (E. S. R., 25, p. 108), to determine the influence of various concentrations, both of furfurol and sodium chlorid, and to ascertain the degree of accuracy of the method.

It was found, contrary to the statement of Flohil, that the copper-reducing power of furfurol is not independent of the concentration, and therefore there appears no ground for the assumption that a simple stochiometric relation between the furfurol and copper exists. The method yielded good results when corrections for concentration were applied, but in a few instances the error was from 3 to 5 per cent. Flohil's statement that the unreduced copper in the liquid after boiling may be determined by Schoorl's iodometric method was confirmed.

Examination of certain milk testing apparatus, H. Tiemann (*Molk. Ztg. [Hildesheim], 25 (1911), Nos. 32, pp. 591, 592; 33, pp. 605–608*).—The forms of apparatus tested in this work were the optical butyrometer and the catalase tube of Lobeck (E. S. R., 23, p. 13), the Gloria centrifuge, the neu-sal apparatus, and an automatic pipette for measuring off alcohol. All of this apparatus is in use in Germany.

The determination of the acidity of milk, O. Rammstedt (*Chem. Ztg., 35 (1911), No. 131, pp. 1218, 1219; abs. in Ztschr. Angew. Chem., 25 (1912), No. 9, p. 436*).—This should be done on the basis of the Soxhlet-Henkel criterions, both on account of uniformity and exactness.

The methods for determining fat most frequently used in milk chemistry, O. von Sobbe (*Molk. Ztg. [Hildesheim], 25 (1911), Nos. 45, pp. 849, 850; 46, pp. 863, 864; 47, pp. 887, 888; 48, pp. 903, 904*).—The methods described are the Wollny refractometric, Gottlieb-Röse, Soxhlet specific gravity (areometric). acid butyrometric of Gerber, sal, "neu-sal," Sichler's sin-acid, and Hammerschmidt's precipitation methods.

Do volatile fatty acids occur in fresh whole milk? W. D. Kooper (*Milchw. Zentbl., 7 (1911), No. 7, pp. 312–314*).—According to the author, no volatile fatty acids occur in pure fresh butter fat, and according to this it would naturally be expected that none would occur in fresh milk. He finds, however, that by distilling with steam fresh milk which contains an addition of a little phosphoric acid a distillate containing fatty acids consisting chiefly of butyric acid is obtained. Skim milk with very little fat was found to yield a higher percentage of acid than the distillate from cream. The original acidity of milk also had some influence upon the final results.

A simple method for detecting butter which was prepared from heated cream, HESSE (*Milchw. Zentbl., 7 (1911), No. 3, pp. 133–134*).—The author has previously reported on a study of the Rothenfusser method (E. S. R., 24, p. 612), as applied to the detection of butter which has been prepared from cream heated to 80° C. or over. The method has now been simplified for the purpose of rendering its use possible by the unskilled, and is as follows: To 10 gm. of butter contained in a Gerber butyrometer, placed in a water bath or drying oven at 40 to 50° C., are added 10 cc. of warm water (40° C.), 2 drops of a 3 per cent hydrogen peroxid solution, and a few drops of Rothenfusser's guaiacol-paraphenylendiamin solution. The butyrometer is stoppered with a rubber, shaken, and centrifuged for 1 minute. If raw cream was used for making the butter the supernatant layer of the fluid will be colored blue.

Examination of crude and refined milk sugar, A. BURR and F. M. BERBERICH (*Molk. Ztg. [Hildesheim], 25 (1911), Nos. 76, pp. 1437–1439; 77, pp. 1461, 1462; 78, pp. 1477–1479*).—This article has been previously noted (E. S. R., 26, p. 313).

The electrical conductivity of impure sugar solutions, and its relation to the specific gravity and sugar content, W. TAEGENER (*Deut. Zuckerindus., 36 (1911), No. 14, pp. 262–264, fig. 1; abs. in Ztschr. Angew. Chem., 24 (1911), No. 28, p. 1338*).—As the author was not able to conduct experiments in factories, he prepared fresh press juices instead of diffusion juices. He specifically points out that these investigations are to be considered preliminary tests. It was noted that a relation does exist between the electrical conductivity, specific gravity, and the sugar content of impure sugar solutions.

The unification of reducing sugar methods.—A correction, P. H. WALKER (*Jour. Amer. Chem. Soc., 34 (1912), No. 2, pp. 202–209*).—Previously noted from another source (E. S. R., 26, p. 312).

A measurement of the translucency of papers, C. F. SAMMET (*U. S. Dept. Agr., Bur. Chem. Circ. 96, pp. 3*).—A practical procedure is described for measuring the translucency of papers. It is free from the objections usually contained in other methods, and can be used for white as well as colored papers. The results are expressed in terms of a standard which is described.

Change in the acid content of distilled vinegar stored in wooden casks, A. BEHRE (*Ztschr. Untersuch. Nahr. u. Genussmtl., 22 (1911), No. 9, pp. 506–509; abs. in Analyst, 37 (1912), No. 430, pp. 23, 24*).—Vinegar stored in wooden casks for a period of 9 months increased in acidity from 7.1 to 9.2 per cent, and in total solids from 0.3 to 0.39 per cent. The concentration of these constituents was in all probability due to the more rapid diffusion of the water through the pores of the wood.

"Further experiments were made in which acetic acid solutions of various strengths were exposed to the atmosphere in glass vessels. In glass cylinders solutions containing from 7.44 to 61.2 per cent of acetic acid scarcely altered in strength during 10 weeks, but when exposed in flasks having narrow necks the more concentrated solutions remained unaltered while those containing less than 19 per cent of acetic acid increased in strength to a slight extent. Considerable changes took place when the solutions were exposed in open beakers; the stronger solutions lost large quantities of acetic acid, while the weaker solutions became stronger. Under these conditions, a vinegar containing 3.17 per cent of acetic acid was found to have 4.68 per cent after the lapse of 4 weeks; a solution containing 19 per cent of acetic acid did not alter in strength; while a solution containing 61.2 per cent lost 2.2 per cent of acetic acid during this period."

Milk sugar, A. BURR and F. M. BERBERICH (*Molk. Ztg. [Hildesheim], 25 (1911), Nos. 70, pp. 1323–1327; 71, pp. 1347, 1348; 72, pp. 1361–1363; 73, pp.*

1385, 1386, figs. 5).—This is a consideration of the development of the milk sugar industry of the world, the use of milk sugar, the methods of obtaining and refining milk sugar, the machinery required therefor, the by-products of milk sugar manufacture, and analyses of the ash of milk sugar and its by-products.

The oil of Douglas fir; a preliminary study of its composition and properties, H. K. BENSON and M. DARRIN (*Jour. Indus. and Engin. Chem., 3 (1911), No. 11, pp. 818–820*).—The conclusion drawn from these tests is that not less than one-third of fir oil consists of terpineol and that fir oil is so closely similar to pine oil in its properties that it may be substituted for it in its commercial application. It is pointed out that pine oil is being used very extensively as a solvent for varnish gums in the cold, for rubber, for nitrocellulose lacquer, in the manufacture of metal polishes, and for general use as an essential oil, and that this market should be open in the future to fir oil.

METEOROLOGY—WATER.

A new service of agricultural meteorology in France, P. KLEIN (*Vie Agr. et Rurale, 1912, No. 7, pp. 169, 170; Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 3, pp. 607–609*).—The service which is now being established in France is described. This service will collaborate with the general meteorological service established in 1885. The new service will be directed by a central committee assisted by technical experts.

District stations will be centrally located in regions having similar meteorological conditions and will as far as possible be attached to scientific institutions, such as observatories and schools of agriculture already existing. These will act as centers for the distribution of forecasts and other meteorological information of regional importance, as well as for the collection of data which may be of importance to the central office.

There will be numerous information and warning stations, also connected where possible with local agricultural institutions. These will receive from the regional stations and give out daily telegraphic reports and other information concerning the principal weather conditions and advice regarding means of protection against unfavorable conditions (storms, frosts, etc.). They will in addition give particular attention to the study of the effect of varying climatic factors on the development of plants and their parasites.

Daily observations in agricultural as well as in pure meteorology will be made at a large number of so-called agricultural posts attached both to the district stations and to the information and warning stations.

Monthly Weather Review (*Mo. Weather Rev., 39 (1911), No. 12, pp. 1791–1949, pls. 10*).—In addition to the usual climatological summaries, weather forecasts and warnings for December, 1911, river and flood observations, lists of additions to the Weather Bureau library and of recent papers on meteorology and seismology, a condensed climatological summary, and climatological tables and charts, this number contains the following special papers:

December, 1911, Lake Levels; [Meteorological] Summary of Year 1911 [in the Lake Region]; Two Years of Low Water in the Arkansas River, by H. F. Alciatore; Notes on the Rivers of the Sacramento and San Joaquin Valleys for December, 1911, by N. R. Taylor; Note on Weather Conditions in the San Joaquin Valley for December, 1911, by W. E. Bonnett; Protecting the California Orange Crop from Frost, by A. G. McAdie (see p. 141); and Notes on Frost at San Diego During December, 1911, by F. A. Carpenter.

Meteorological observations, A. J. PATTEN and D. A. SEELEY (*Ann. Rpt. Bd. Agr. Mich., 1911, pp. 113–126*).—Tabulated daily and monthly summaries are

given of observations during 1910 at East Lansing, Mich., on temperature, pressure, precipitation, cloudiness, wind movement, etc.

The climate of Prince George's County, W. H. ALEXANDER (In *The Physical Features of Prince George's County. Baltimore: Md. Geol. Survey, 1911, pp. 185–206, fig. 1*).—The available data regarding temperature and precipitation are summarized. The average annual temperature is 54° F., the annual precipitation 42 in.

Cold air drainage, F. SHREVE (*Plant World, 15 (1912), No. 5, pp. 110–115, fig. 1*).—Temperature observations on and near the flood plain of the Santa Cruz River, and at different elevations (ridge and canyon) in the Santa Catalina Mountains up to 8,000 ft., indicated the flow of a shallow stream of cold air down the canyon, constituting an important factor in the limitation of the upward distribution of desert species of plants. "A number of the most conspicuous desert species range to much higher altitudes on ridges and the higher slopes of canyons than they do in the bottoms and lower slopes of canyons. Samples secured by the writer indicate that there is no essential difference between the soil moisture of ridges and the bottoms of canyons during the driest portions of the year. Neither is there any evidence that desert species would fail to survive in the canyon bottoms if they were somewhat higher in soil moisture content. An explanation of the absence of the desert species from canyon bottoms and their occurrence at higher elevations on ridges must be sought in some operation of the chimenal factors rather than in the factors of soil and atmospheric moisture."

The relation between the amount of rainfall and of seepage, LUEDECKE (*Separate from Kulturtechniker [Breslau], pp. 17, pls. 6, figs. 3*).—This is a detailed account of the work and observations with rain and with percolation gages as carried out by Latham in England (E. S. R., 22, p. 15).

Water resources of the Penobscot River basin, Maine, H. K. BARROWS and C. C. BABB (*U. S. Geol. Survey, Water-Supply Paper 279, pp. 285, pls. 19, figs. 5*).—This paper is "compiled chiefly from the records, reports, and maps of the United States Geological Survey and from the results of surveys made in cooperation with the Maine State Survey Commission. The report includes all data on precipitation, stream flow, water storage, and water power that were available at the end of the calendar year 1909 and is accompanied by plans and profiles of the principal rivers, lakes, and ponds in the basin. It contains also a gazetteer of the water features in the Penobscot basin, by Gertrude E. Schulz."

Surface water supply of the south Atlantic coast and eastern Gulf of Mexico, 1910, M. R. HALL and J. G. MATHERS (*U. S. Geol. Survey, Water-Supply Paper 282, pp. 109, pls. 3*).—This paper "contains descriptions of the two drainage basins named and the results of stream measurements in them, namely, gage-height records, results of current-meter measurements, and daily and monthly discharges."

Surface water supply of Hudson Bay and Upper Mississippi River basins, 1910, R. FOLLANSBEE, A. H. HORTON, and G. C. STEVENS (*U. S. Geol. Survey, Water-Supply Paper 285, pp. 318, pls. 4*).—Data corresponding to the above are reported for the Hudson Bay and Upper Mississippi River basins.

Gaging stations maintained by the United States Geological Survey 1888–1910 and Survey publications relating to water resources, R. D. WOOD (*U. S. Geol. Survey, Water-Supply Paper 280, pp. 102*).—The list of gaging stations is arranged according to drainage basins and the publications chronologically, but with a finding list arranged alphabetically by States. There is also an index of authors and of streams.

Analyses of artesian and subartesian waters, New South Wales, J. C. H. MINGAYE and H. P. WHITE (*Rpt. Dept. Pub. Works N. S. Wales, 1911, pp. 48–54*).—Mineral analyses of a large number of samples are tabulated.

SOILS—FERTILIZERS.

The soil forming processes and the main principles of soil classification, P. Kossovich (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 11 (1910), No. 5, pp. 679–703*).—The author is of the opinion that a general soil classification can not be based upon any combination of outside soil-forming factors (such as climate, parent rock, topography, plant and animal life, and age) and much less upon any single factor, however great its influence may be. A scientific soil classification should be based rather upon the characteristic inner soil properties and soil forming processes.

Bearing in mind that the greater part of soils is of independent formation but that there are some soils (generally low-lying) which contain weathering products transported from other soils, the author divides all surface soils into 2 main classes, the genetically independent and the genetically dependent. On the basis of soil forming processes he divides the first class into the following types: Dry desert, semiarid desert, chernozem, podzol, tundra, upland moor, and lateritic soils. The genetically dependent soils are divided into soils formed with the addition, respectively, of products of the semiarid, chernozem, podzol, and lateritic soil forming processes. See also a previous note (E. S. R., 12, p. 704).

Soils of arid and of humid regions, E. W. Hilgard (*Internat. Mitt. Bodenk., 1 (1912), No. 5, pp. 415–429*).—This is a brief summary of the more important results of the author's investigations of the physical and chemical properties of arid and of humid soils which, with the exception of certain of the more recent contributions to the subject, are to be found in the author's book on Soils (E. S. R., 18, p. 315), in publications of the California Experiment Station, and in Wollny's Forschungen auf dem Gebiete der Agrikultur-physik, 1893.

Soil investigations in the United States, C. L. Henning (*Internat. Mitt. Bodenk., 1 (1912), No. 5, pp. 440–462*).—The author reviews the history and organization of the Bureau of Soils of this Department, and discusses in some detail the methods and extent of the soil survey work of this Bureau, including a brief description of the more important soil series of the different soil provinces of the country.

A contribution to the knowledge of Cuban cultivated soils, E. W. Müller (*Tropenpflanzer, 15 (1911), No. 12, pp. 660–679*).—This is an account of a study of the physical and chemical properties and crop adaptation of these soils. Five main groups of soils are distinguished: A light gray colored, or so-called agricultural group; the yellow, red, and dark soils; and a sandy type developed in Herradura and on the Isle of Pines.

The light gray colored soils occupy the western part of Cuba and constitute the typical tobacco soils of the island. They are residuary in character and contain numerous concretions with a high phosphoric acid content. The concretions of the surface soils are rather hard, rounded, and brown in color. Those of the subsoil approach a red color and crumble easily. Analyses showed as high as 20 to 25 per cent of phosphoric acid in the subsurface concretions. The light gray soils, in general, are open in structure, containing large percentages of stones, gravel, and coarse sand, characteristics which are considered to adapt them for the production of tobacco of a fine grained and an elastic quality, and of superior aroma. They are stated to be well supplied with nitrogen and the mineral constituents of plant food, the analyses reported showing an average nitrogen content of from 0.037 to 0.206 per cent; phosphoric acid, 0.054 to 0.263 per cent; potash, 0.023 to 0.139 per cent; and lime, 0.069 to 0.513 per cent.

The yellow soils occupy the central part of Cuba to the east of Havana. They differ from the light gray soils in their higher content of clay and fewer rock fragments. They have an average content of nitrogen of from 0.115 to 0.286 per cent; phosphoric acid, 0.064 to 0.221 per cent; potash, 0.037 to 0.182 per cent; and lime, 0.127 to 0.892 per cent.

The red soils occupy a considerable area in east central Cuba and are characterized by their high clay content, being derived from weathered limestone rich in iron, alumina, and silica, and by high lime and phosphoric acid contents. Tobacco is the principal crop. In the extreme eastern part of the region there occur rather extensive areas of washed soils which differ from the typical red soils in that they are less porous and more moist. Sugar cane is the principal crop grown thereon. The analyses of these soils showed for nitrogen from 0.192 to 0.290 per cent; phosphoric acid, 0.010 to 0.706 per cent; potash, 0.072 to 0.514 per cent; and lime, 0.278 to 15.040 per cent.

The black soils occupy the eastern lowland region of Cuba. They are noted for their high calcium carbonate and very high nitrogen contents. It is believed that the dark color is due to the large amounts of plant débris from the sugar cane. Analyses showed nitrogen, 0.045 to 0.422 per cent; phosphoric acid, 0.030 to 0.356 per cent; potash, 0.038 to 0.356 per cent; and lime, 1.038 to 53.329 per cent.

The sandy soils of Herradura and of the Isle of Pines are used for the production of citrus fruits. They are stated to be poor in the mineral constituents of plant food, analyses reported showing nitrogen, 0.076 to 0.104 per cent; phosphoric acid, 0.011 to 0.021 per cent; potash, 0.004 to 0.006 per cent; and lime, 0.002 to 0.031 per cent.

The use of fertilizers is stated to be quite general on all the soil types.

Incidentally, analyses of bat guano deposits of the mountain caves of western Cuba are reported. These deposits, although being used as a fertilizer, are not very extensive and are generally low in plant-food constituents.

Soil investigations, W. P. Kelley (*Hawaii Sta. Rpt. 1911, pp. 43–51, figs. 2*).—Brief reference is made to previous investigations on pineapple soils (E. S. R., 24, p. 621) and an account is given of a further study of movement of water in different Hawaiian soils. These studies included measurements of the rate of capillary rise and percolation of water through columns of soil in glass cylinders.

The results show that capillary movement of water in the soils varies between wide extremes. It was most rapid in the experiments here reported in humus sandy soil and slowest in clay soil. Percolation was slowest through soils containing the highest percentage of clay and fine silt.

Brief reference is also made to a comparison of methods of determining the so-called humus in soils (E. S. R., 27, p. 7) and to the beginning of work on a soil survey of the islands.

The origin, composition, and properties of the manganiferous soils of Oahu, W. P. Kelley (*Hawaii Sta. Bul. 26, pp. 42–56*).—These soils, which are located on the upland plateau between the Waianae and Koolau Mountain ranges, at an elevation of from 650 to 900 ft., frequently contain 5 per cent of manganese oxid (Mn_3O_4) and sometimes as much as from 9 to 10 per cent.

A study of the chemical composition of the lava from which the soils are derived and of the lava alteration products, as well as of the position in which the soils occur, indicates "that the concentration of manganese has come about through the action of solution and leaching, followed by subsequent oxidation and deposition." The manganese has become soluble in the normal weathering of the basaltic lavas and has been transported and redeposited from the solution.

"The occurrence of manganese concretions, the largest in size of which being some depth below the surface, and deposited in the lower levels in the alluvial sheet but not in the sedimentary or residual soil, together with the sharp line of stratification separating the alluvial from the residual strata, indicate that there has been a submergence, during which time the deposition of the alluvial soil and the accumulation of manganese concretions took place. Subsequent leaching further accentuated the accumulation of the manganese in the lower places, especially in basins or at the bases of long slopes.

"The solubility in weak organic acids shows that the availability of the manganese is relatively high and that manganese probably exists in the soil moisture and in solution around the absorbing surfaces of roots in greater quantities than any other element. Therefore it exists in just the condition to exert its full physiological effects on plants. The physical properties of the manganiferous soils are more nearly ideal than are those of red soils. They contain less clay, and more of the coarser particles. Consequently the circulation of air is greater in the manganese soil.

"Nitrification and ammonification appear not to be influenced by the presence of manganese in the soil. That the former has been found to take place more advantageously in the manganese soil can probably be accounted for by the fact that the circulation of air is less obstructed in this type."

Modification of the method of mechanical soil analysis, C. C. Fletcher and H. Bryan (*U. S. Dept. Agr., Bur. Soils Bul. 84, pp. 3–16, pls. 7*).—This bulletin describes the apparatus and methods used in making the mechanical analysis of soils as at present carried out in the laboratory of the Bureau of Soils.

The most important modification of previous methods is that for determining the amount of clay. It was decided to abandon the final transfer of the clay solution to the platinum dishes and to complete the evaporation in the enameled-ware saucepans and to weigh the clay in them without transfer. Much smaller enameled cups (about 300 cc. capacity and 180 gm. weight) were adopted for convenience in weighing and to decrease the likelihood of the entry of dust. It is stated that the method has the disadvantage of requiring a much heavier balance, but the determinations are none the less accurate and a great saving in time is effected. The method may be still further shortened in case of routine analyses by abandoning altogether the direct determination of clay and obtaining its percentage by difference. "The error thus introduced is probably no greater than that involved in the centrifugal (or other) separation of the clay from the silt. The errors in both cases are generally within the limits of variation which may be expected between different samples of the same soil.

"In 100 consecutive analyses taken at random from the recent files of the Bureau of Soils the variations between the percentage of clay as directly determined and those obtained by difference range between 0 and 2.28 per cent. In 2 cases the variation is over 2 per cent; in 3 cases, between 2 per cent and 1.5 per cent; and in 6 cases between 1.5 per cent and 1 per cent. In all other cases the variations were less than 1 per cent.

"It is probable that in many cases the determination by difference is the more accurate, as all errors due to access of dust or to loss of clay suspension are thus avoided. Errors due to a not impossible change in the state of hydration of the clay are also eliminated. It is believed that in the vast majority of cases the method of determining clay by difference will be accurate within 1 per cent, and no greater accuracy is necessary or even desirable for purposes of soil classification. . . . The direct determination must, of course, be retained for cases of special importance or where a check is necessary, and is probably also desirable for students and for small laboratories where a mechanical analysis is only made occasionally."

The estimation of certain physical properties of soil, G. ACCHINLECK (*West Indian Bul., 12 (1912), No. 1, pp. 50–68*).—In this article an attempt is made to coordinate the work of a number of investigators in the West Indies in estimating the shrinkage and friability of soils and the relation between these properties of the soil and its crop-bearing power.

In determining the shrinkage the soil sample was first kneaded to a proper degree of plasticity. "A brick is then made by pressing the kneaded sample into the space between 2 small cleats nailed on a length of board, the cleats being 1 in. high, 1 in. apart, and 3 in. long. The ends and top of the brick are then trimmed level with the edges of the cleats, and the brick removed. Two fine pins are inserted to their heads into the brick, at as nearly as possible 50 mm. apart, and the interval between them accurately measured with a pair of dividers or directly by means of a scale. The brick is then laid on its side and left to dry gradually, and the interval between the pins is measured daily until shrinkage ceases."

Trials with this method on the surface and subsoil of several cacao fields showed that cacao did not grow well in surface soils with a shrinkage of over 10 per cent, whereas in soils under 10 per cent good growth was made. In subsoils with a shrinkage of over 12 per cent the plant did poorly, and under 12 per cent good growth was made. It is believed "that the estimation of shrinkage is capable of a considerable degree of accuracy. Future efforts should be along the lines of erecting standards of shrinkage for various crops, and of investigating further the accuracy of the standard temporarily adopted for cacao. The subsoil should be looked on as of perhaps greater importance than the top soil when dealing with deep rooting and permanent crops. Much good work remains to be carried out in determining the limits of shrinkage to be assigned to soils for various crops, and citrus fruits, cotton, rubber, sugar cane, and spices should eventually be brought under the similar standards and have their respective suitable areas assigned to them."

The determinations of friability were carried out by molding cylinders of soil of definite diameter and length and subjecting them to end-pressure until they broke, the weight necessary being recorded. The method was found to be accurate enough to classify soils on broad lines. As with the determination of shrinkage, it is believed that the method can be much improved and that standards of friability for soils and for special crops should be erected. The ratio of shrinkage to clay content in samples of a given soil may "afford a ready means of determining the approximate percentage of agricultural clay in a sample of soil, without having recourse to elaborate and tedious methods of physical soil analysis; if so, it should serve as a valuable aid to the soil analyst, inasmuch as it would enable a considerable amount of useful information to be obtained with a small expenditure of labor. Once a physical type for a soil has been established, it should be possible to study by means of it, in considerable detail, local variations from the type."

The determination of hygroscopicity and the value of physical analyses of soils, E. A. MITSCHERLICH and R. FLOESS (*Internat. Mitt. Bodenk., 1 (1912), No. 5, pp. 463–480*).—In comparative tests of the Rodewald-Mitscherlich method of determining the hygroscopicity (E. S. R., 15, p. 847) and of the Ehrenberg-Pick modification of it (E. S. R., 24, p. 521), and studies of the relation of hygroscopicity and physical constitution of soils to plant growth, the Ehrenberg-Pick modification proved unreliable because of the condensation of water and the growth of molds in the soil as a result of the length of time required to bring about vapor equilibrium. The hygroscopicity, as determined by this method, varied with the water content of the original soil, and changes in the surface area of the soil could not be estimated. The importance of hygro-

scopicity and the colloidal material of the soil in relation to the physics and chemistry of plant growth is discussed.

The drying of soils, G. A. RITTER (*Centbl. Bakt. [etc.], 2. Abt., 33 (1912), No. 1–6, pp. 116–143*).—Studies are reported of the bacterial activity of wet and of dried soils as measured by the formation of acid and of carbon dioxid in culture solutions, as affected by the physical and chemical properties of the soil, the character of the culture medium, the kind of vegetation, alternate drying and wetting, rate and degree of drying, and temperature. The Remy method or a modification of it was used.

There was found to be a difference in the bacterial activity of the dry as compared with that of the wet soils, the dry soils causing a quicker and more intense fermentation. These differences were most marked at the beginning of fermentation but later tended to disappear. The time of reaching the maximum formation of acid varied for the different soils, but always was shortest for the dry soils. The maxima of acid formation varied with the different kinds of soil as well as with the water content of a given soil, although the latter variation, excepting in a wet and heavy clay soil, was for the most part unimportant and often fell within the limits of experimental error. The calcium carbonate content of the soils also influenced somewhat the formation of acid, but the virulence of the bacteria as determined by the physical and chemical properties of the soil was the determining factor. It is held that the extent of variation in the physiological relations in wet and in dry samples of the same soil is determined by or is a function of the bacterial activity of the soil.

The author asserts that the Remy method of bacteriological soil investigations is correct in principle. He urges that attention be given to the elimination of variable factors which may vitiate the results, such as variable water content of the soil, careless methods of preserving soil samples, and variations in temperature and light.

The oxygen content of soil water and its influence on the swamping of the soil and the growth of forests, A. H. HESSELMAN (*Meddel. Stat. Skogsförsöksanst. (Mitt. Forstl. Vers. Anst. Schwedens), 1910, No. 7, pp. 91–125+ XIII–XVI, figs. 5*).—Studies of the oxygen content in surface and subsoil waters of forest swamps and of the absorption of oxygen from water by different forest molds and soils are reported with a view of determining the cause of the swamping of pine forests in northern Sweden.

The results, in general, showed that where there was sufficient movement the water was well supplied with oxygen. The water of the moors of swamped pine forests contained no oxygen at a depth of 20 cm. Near the surface it contained traces of oxygen. Sphagnum layers reduced the oxygen content of the water. The absorption of oxygen was much less for beech forest than for pine forest soils and for sterilized neutral than for unsterilized soils, and less for the humus of a rapidly growing pine forest than for that of a swamping forest.

The general conclusion drawn from these studies is that the swamping of forest soils of Sweden is not due to overabundance of water but to its low oxygen content. In some places, where the water was in motion and thus aerated, pine forests made a very vigorous growth even where the soil was covered with water.

Evaporation from irrigated soils, S. FORTIER and S. H. BECKETT (*U. S. Dept. Agr., Office Expt. Stas. Bul. 248, pp. 77, pls. 2, figs. 27*).—This bulletin reports a continuation of experiments reported upon in a previous bulletin (E. S. R., 18, p. 1087), extending the observations to colder and more elevated regions.

Observations by the methods described in the previous bulletin were made in cooperation with several experiment stations on the effect on evaporation with

soil mulches of different depths, cultivation to different depths, and shallow and deep furrow irrigation.

The results show that a dry granular soil mulch 3 in. deep reduced the loss by evaporation from the soil at least one-half, a mulch 6 in. deep saved 75 per cent of the evaporation, and a 9-in. mulch was still more effective in reducing evaporation, but was too expensive to be of practical value. The effect of cultivation in lessening evaporation was especially marked in case of the heavier soils. "There is a tendency in light sandy soils for the uncultivated surfaces to mulch themselves, and after the first few days following the irrigation the losses diminish very rapidly, and in the end little advantage is shown in favor of cultivation."

The loss of water decreased with the depth of application. "Practical considerations, however, limit the depth. Under conditions such as exist throughout the arid region this practical limit lies, it is believed, somewhere between 6 and 9 in. . . . In general, it may be stated that wherever the soil and the crop will permit the water should be applied in deep furrows rather than by flooding; that one deep, heavy irrigation is preferable to numerous lighter irrigations, providing the crop is deep-rooted; that cultivation should be practiced as early as possible after irrigation; and that deep and frequent cultivation prevents evaporation and aerates the soil."

Effect of heat and oxidation on the phosphorus of the soil, P. P. PETERSON (*Wisconsin Sta. Research Bul. 19, pp. 16*).—The author briefly reviews previous investigations on the subject, and reports the results of studies of the effect of heat and of oxidation with hydrogen peroxid on the solubility of phosphoric acid of the soil and of wavellite and dufrenite.

Heating wavellite for 5 hours to 200° increased the solubility of the phosphoric acid from 4 to 50 per cent, and heating it to 240° increased the solubility to 100 per cent. Dufrenite, when heated to 200°, was but slightly increased in solubility.

The increase in solubility of the phosphoric acid of the soil was small at 130° and rose rapidly with a rise in temperature above this point, reaching a maximum at 200°. The solubility of the phosphoric acid in clay and clay loam soils was increased on an average about 50 per cent by decomposing the organic matter with hydrogen peroxid. For sandy soils the increase was about 30 per cent. The increase in solubility by treating with hydrogen peroxid was always larger than that due to heating, and there was no increase in solubility by heating after treatment with hydrogen peroxid. The phosphoric acid rendered soluble by heating was from the same source as that obtained from oxidation with hydrogen peroxid. The solubility of the mineral phosphates of the soil did not seem to be increased by heating to 240°. The increase in solubility was greater in the early than in the later stages of oxidation, being greatest when from 25 to 30 per cent of the organic matter had been decomposed and ceasing with 60 per cent.

The solubility of calcium and manganese was not increased by oxidation, that of iron and aluminum was increased, the increase following pretty closely that in the solubility of phosphoric acid. "The increased solubility of phosphorus by oxidation with hydrogen peroxid probably comes, in large part, from precipitated iron and aluminum phosphates, held from solution before the oxidation as part of a complex of insoluble organic matter and compounds of iron and aluminum. Oxidation increases the solubility of the phosphorus but slightly in subsoils. Heating after oxidation has a more marked effect on the solubility of the phosphorus in the subsoil than it has in the surface soil."

Methods of determining the intensity of respiration of bacteria in the soil, J. STOKLASA (*Ztschr. Landw. Versuchsw. Österr., 14 (1911), No. 11, pp.*

1243–1279, figs. 2; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 2, pp. 376–378).—This is a report of a continuation and extension of previous work by the author (E. S. R., 18, p. 1024). A special form of apparatus used in these investigations is described, and the results of studies of the effect of cultivation, fertilization, kind of crop, and composition of organic matter on the intensity of respiration of bacteria in the soils are reported.

The essential part of the apparatus used was a glass cylinder fitted with a sieve at about 5 cm. from the bottom. The soil was placed in the upper part of the cylinder, and sterilized air (or hydrogen for anaerobic bacteria) was introduced into the bottom of the cylinder by means of a glass tube. A second tube, projecting a few centimeters into the top of the cylinder, conducted the carbon dioxid evolved from the soil through the apparatus for its absorption and determination. The cylinder containing the soil was kept in a thermostat during the experiment so that the temperature could be carefully regulated.

The bacterial activity as measured by the amount of carbon dioxid given off was influenced not only by the mechanical condition and fertility of the soil, but also by the kind of crop grown. The greater the air space of the soil the greater was the intensity of respiration of the bacteria.

By sterilizing the soil and inoculating it with equal quantities of bacteria of the same virulence it was possible to determine by means of the carbon dioxid given off the power of the bacteria to decompose the organic matter in the soil, and the author concludes that intensity of respiration of bacteria is a better basis for judging the biological activities of soils than the amount of organic matter present. Intensity of respiration shows the presence in the soil not only of active bacteria but also of easily decomposed organic matter.

The chemical composition of the drainage water was also found to furnish a means of judging the intensity of the biochemical processes in the soil. It was found, for example, that the calcium bicarbonate content of the drainage water increased with the bacterial activity, irrespective of the lime content of the soil, and stood in direct relation to the carbon dioxid produced by the soil micro-organisms. This tends to show that the determination of the carbon dioxid given off by a soil furnishes a reliable means of judging of the transforming power of both autotrophic and heterotrophic bacteria in the soil, and that the amount of carbon dioxid produced by a given quantity of soil in a unit of time at a fixed temperature and known degree of moisture represents accurately the physiological combustion taking place and makes it possible to compare the bacterial activity in different soils. This varies widely with (1) the air or water capacity of the soil, (2) the character and amounts of decomposable organic matter in the soil, (3) the presence of organic and inorganic nitrogenous substances and of easily assimilated substances containing phosphorus, potash, etc., (4) the number of autotrophic and heterotrophic bacteria, and (5) the chemical reaction of the soil.

The most active respiration occurs in neutral or slightly alkaline soils abundantly supplied with air and with readily assimilable nitrogen, phosphorus, sulphur, chlorin, potash, soda, magnesia, lime, iron, alumina, and manganese. The presence of alumina is necessary to the ready assimilation of iron and manganese by autotrophic and heterotrophic bacteria.

The form of nitrogen has a marked influence in determining the character of bacteria predominating in a soil, and hence the intensity of respiration. In forest soils, for example, bacteria which by preference assimilate organic nitrogen predominate. In soils in which nitrification is active the predominant bacteria are those which readily assimilate nitric nitrogen. On the other hand,

bacterial respiration is intensified by applications of various substances to the soil according to the character of the bacteria present. Those soils showing low bacterial activity are likely to be most benefited by applications of nitrates. If applications of monocalcium phosphate and potassium chlorid increase the production of carbon dioxid this is an indication that the soil is deficient in assimilable phosphoric acid and potash.

Toxic effects of "alkali salts" in soils on soil bacteria.—II, Nitrification, C. B. LIPMAN (*Centbl. Bakt. [etc.], 2. Abt., 33 (1912), No. 11–14, pp. 305–313, figs. 2*).—This is a second communication on this subject, the first (E. S. R., 26, p. 322), dealing with the effect of the alkali salts on ammonification.

Summarizing his results, the author concludes that "nitrification in soils is inhibited by the presence of certain amounts of each of the 'alkali salts' sodium chlorid, sodium sulphate, and sodium carbonate. Sodium carbonate is the most toxic, sodium sulphate the least toxic, and sodium chlorid occupies an intermediate position. The actual points at which these salts become markedly toxic toward nitrification in soils are at about 0.025 per cent sodium carbonate, 0.35 per cent sodium sulphate, 0.1 per cent or less of sodium chlorid. The anion bears an important relation to the toxic effects of salts as illustrated in the results above discussed, a fact which has not received very much consideration in the past. The salt effects noted should, like results obtained on ammonification in work above cited, have an important bearing on the practical reclamation of alkali lands. The nitrifying bacteria are affected similarly to the higher plant by the alkali salts and quite differently from the ammonifying bacteria."

Maintenance of soil fertility: Plans and summary tables (*Ohio Sta. Circ. 120, pp. 95–115, figs. 5*).—This is one of the annual statements on the subject (E. S. R., 26, p. 423), bringing the data for the experiments up to the end of 1911 and summarizing the results for 18 years (1894–1911).

Reaction changes in the soil by growth of plants and fertilizing, J. G. MASCHHAUPT (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefstat. [Netherlands], 1911, No. 10, pp. 50–93, pls. 4; abs. in Chem. Abs., 6 (1912), No. 11, p. 1487*).—Previous investigations on the subject are reviewed, and studies of the effect of the growth of plants on the reaction of solutions of ammonium, potassium, sodium, calcium, and magnesium nitrates, sulphates, and chlorids are reported.

The tests were made (1) by growing the plants in soil in flowerpots with perforated bottoms, the roots being allowed to dip into breakers which contained, alternately, pure solutions, and sand saturated with solutions of the salts named; and (2) by growing the seedlings in the solutions of the salts. It is stated that the first method was well adapted for the purpose of these experiments and that it has a decided advantage in that the plants are grown in the natural soil conditions. Better results were obtained when the roots of the seedlings were first developed to some extent in a culture solution before transferring to the solutions of pure salts. It was thought that a study of the effect of plant growth on the reaction of the solutions would indicate the conditions which may arise in the soil from continued application of a fertilizer containing a predominance of any one salt.

The results of the studies show that sodium nitrate was physiologically alkaline. In one case, using rye, an alkalinity of 0.006-normal was obtained. The alkalinity was substantially increased in sand culture, 0.028-normal being obtained with corn. Ammonium sulphate was physiologically acid, the highest degree of acidity being 0.015-normal obtained with corn in sand culture. Ammonium nitrate was physiologically acid but less so than the sulphate. This result is stated to agree with the work of D. N. Prianishnikov (E. S. R., 17,

p. 538), who observed a favorable influence of ammonium nitrate on the assimilation of phosphoric acid from difficultly soluble phosphates. In 2 tests, with the entire root system in the solution, ammonium nitrate gave a weakly alkaline reaction. Potassium nitrate was generally physiologically alkaline, but weaker than sodium nitrate. Calcium nitrate was physiologically alkaline. Ammonium chlorid was decidedly acid, and very injurious to the roots. Solutions of potassium, sodium, magnesium, and calcium chlorids and sulphates were weakly alkaline.

The general conclusion drawn from these studies is that the change in the reaction of the solutions was not determined solely by the process of assimilation of one or of the other ion by the plant roots, but that there was an exosmose of calcium and potassium (and probably other elements) from the root cells. This phenomenon of exosmose is regarded as the probable explanation of the toxicity of the solutions of pure salts and makes intelligible the action of calcium salts in lessening the toxicity of pure salt solutions.

Influence of phosphatic and potassic fertilizers on the chemical composition of the forage of natural pastures, P. Chavan (*Ann. Agr. Suisse, 12 (1911), No. 4, pp. 259–272, figs. 3*).—Analyses of grasses, legumes, and other plants growing on Alpine grass lands near Séchey, Switzerland, are reported, showing that fertilizing with phosphates increased the cellulose content of the plants as a result of the influence of the phosphoric acid in hastening maturity. Fertilizing with phosphates and potassic fertilizers increased the phosphoric acid and potash content of the ash of the plants. The use of both fertilizers, but particularly the phosphatic fertilizer, promoted the absorption of nitrogen from the soil by Gramineæ and other families of plants. They also increased the fertilizing effect of the organic matter of the soil. Phosphatic fertilizers increased the potash content of the plants. These results differ materially from those reported by A. Stutzer, who found that phosphatic fertilizers had little effect upon the yield of Gramineæ, increased but slightly their content of phosphoric acid, and did not increase the potash and nitrogen content of the plants.

The after effect of fertilizing with various potash rocks on moor soils, H. von Feilitzen (*Deut. Landw. Presse, 39 (1912), No. 21, p. 250, fig. 1*).—A brief account is here given of comparisons of phonolite, nephalin, and similar substances with potash salts. These showed that there was an appreciable after-effect of both the phonolite and the nephalin, but that during the second year as well as the first the increase did not compare with that obtained with the water-soluble Stassfurt salt.

Experiments on the action of kainit, 40 per cent potash salt, and phonolite, 1904–1910, W. Schneidewind, D. Meyer, and F. Münter (*Arb. Deut. Landw. Gesell., 1911, No. 193, pp. 173; abs. in Zentbl. Agr. Chem., 41 (1912), No. 3, pp. 165–170*).—This is a detailed account of pot experiments on (1) absorption of potassium and sodium salts in fall and spring fertilizing, (2) the action of sodium chlorid and sulphate and magnesium chlorid and sulphate on fodder beets, (3) the action of increasing amounts of sodium and magnesium chlorids and magnesium sulphate on plant growth, and (4) the action of phonolite and Pohl zeolite fertilizer (lime trass) in comparison with potassium chlorid and carbonate; and field experiments comparing the potash fertilizers named on potatoes, sugar beets, fodder beets, wheat, rye, and barley.

Among the more important general conclusions arrived at from these experiments were that spring application of potash fertilizers gave decidedly better results than fall application on sandy soils in case of pots which had not been freshly filled in the fall. This is ascribed to the washing out of potash from the soil with fall application. Spring applications were better in all cases with

loam soils. This result is ascribed to the strong absorptive power of such soils for potash.

A decided increase in yield of fodder beets followed applications of sodium chlorid and sodium sulphate, especially the former. No such result was obtained in the case of magnesium salts, and magnesium chlorid was positively harmful. Magnesium chlorid, and in certain cases sodium chlorid, increased the assimilation of soil potash without increasing the yield.

Large applications of magnesium sulphate (0.25 to 0.5 per cent) produced beneficial results, especially on calcareous loam soils, and even with applications of 1 per cent there was an appreciable increase in yield of grain on such soils. Similar results were obtained with sodium sulphate. On sandy soils, however, the sulphates were injurious in all cases, but not to the same extent as the chlorids. Magnesium and sodium chlorids applied at the rate of 0.25 per cent were not injurious on calcareous loam soils, but were injurious when applied in double this amount. On loam soils poor in lime applications of 0.25 per cent reduced the yield of grain and on sandy soils these salts in all amounts applied absolutely prevented the growth of plants. The chlorids increased the assimilation of lime while the sulphates reduced it.

It is pointed out that these results obtained in pot experiments are obviously not applicable in practice except in so far as they indicate that sulphates may be safely used in larger amounts than the chlorids. Phonolite showed very little effect as compared with potassium chlorid and carbonate applied to potatoes, wheat, and a mixture of oats and clover.

The field experiments indicated that potash salts were not needed for potatoes which had received a liberal application of manure. On sandy soils spring application of potash salts gave better results than fall application. The percentage of starch was lower, but the total yield was larger. On loam soils the reduction in starch was greater than that in sandy soils. There was little difference as regards the effect of spring and fall application, except that in general the starch was reduced to a greater extent by spring application. The yield was slightly less with 40 per cent potash salt, and the starch content slightly greater, than with kainit. Normal applications of phonolite were almost without effect; larger applications had little effect upon yield but showed less reduction of starch content than the potash salts. Potassium carbonate increased the starch content of potatoes.

The potash fertilizers increased the yield of dry matter and sugar in sugar beets on all soils, the best results being obtained with fall application. On loam soil 40 per cent potash salt and kainit were about equally effective. The 40 per cent salt was slightly better on heavy soils. Phonolite was almost without effect on sugar beets.

Potash salts increased the yield of fodder beets both with and without manure except on humus soils (with manure). Slightly larger yields were obtained with fall application. The 40 per cent salt gave a slightly larger yield of dry matter than kainit. Like the potato, but unlike the sugar beet, the fodder beet appears to be especially sensitive to large applications of potash salts. Phonolite had little effect.

Fall application of potash salts gave better results than spring application on wheat. Kainit and 40 per cent salt were about equally effective on humus loam soil. On heavy loam soil the 40 per cent salt gave better results. Phonolite was ineffective.

No benefit was obtained from the use of potash salts on rye. The results were very variable with barley, and were inconclusive as regards spring and fall application. The 40 per cent salt appeared to be somewhat more effective than the kainit for this crop.

On the availability of the potash in "rapakivi" and pegmatite granites. O. ASCHAN (*Ztschr. Anorgan. Chem., 74 (1912), No. 1, pp. 55–73; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 4, p. 195*).—These granites were subjected to various treatments, including the action of lime water, sulphuric acid, hydrochloric acid, calcium chlorid, lime and salt mixture, and peat, in order to find a practical means of rendering the potash which they contain in the form of feldspar available for fertilizing purposes.

The results indicate that treatment with acids is not a practical method. Practically complete solution of the potash was obtained by fusion with calcium chlorid or with lime-salt mixture, the former being considered perhaps the better method if the calcium chlorid can be obtained cheaply. The greater part of the potash was made soluble as hydroxid by heating under pressure with lime water. The solubility of the potash and phosphoric acid in the fine ground feldspar was increased to a marked extent in the course of 6½ months when mixed with moor soil at the rate of 1 part of feldspar to 9 of soil. The solubility was still further increased when ammonium sulphate was added to the mixture.

Factors influencing the availability of rock phosphate, E. TRUOG (*Wisconsin Sta. Research Bul. 20, pp. 17–51, figs. 4*).—Previous investigations on this subject are reviewed, and studies of the effect of fermenting manure and grass, and of thoroughness of mixing with the soil, on the availability of floats are reported.

In laboratory experiments in which organic matter was composted with raw phosphates there was little or no solvent action of the fermenting material. The solvent action was apparently measured by the amount of phosphate which the water containing carbon dioxid could hold in solution, and in the laboratory experiments a state of equilibrium in this respect was quickly reached and there was no further solvent action. Under field conditions, however, there was a continual removal of the dissolved substances, resulting in conditions which greatly increased the solvent action of the carbon dioxid.

The mixing of floats with manure caused an immediate decrease in the solubility of the phosphoric acid in 0.2 per cent citric-acid solution, indicating "that the availability of phosphates as measured by a solvent like 0.2 per cent citric acid may be entirely different from availability as measured by growing crop."

When floats was thoroughly mixed with the feeding area of the soil its availability was increased to such an extent that some species of plants were apparently able to secure almost an adequate supply of phosphoric acid from this material. Apparently the carbon dioxid given off by the plant roots was instrumental in increasing the availability of the phosphoric acid of the floats. The addition of manure to the soil greatly increased the carbon dioxid production and for a short time measurably increased the solvent action on floats.

The general conclusion, therefore, is that the use of organic matter in connection with floats increases its availability to plants. "The organic matter brings about this increased availability by favoring a more efficient initial mechanical distribution of the floats with the soil and by favoring the chemical and biological processes that give rise to carbon dioxid and other agencies which attack floats and ultimately give the material a finer and more uniform distribution through the soil."

Report of a reconnoissance of the Lyon nitrate prospect near Queen, N. Mex., E. E. FREE (*U. S. Dept. Agr., Bur. Soils Circ. 62, pp. 6, figs. 5*).—The examinations reported show the occurrence of small amounts of potassium nitrate, but not enough "to have any important commercial value."

The present status of the artificial nitrogen fertilizer industry. F. W. DAFERT (*Ztschr. Landw. Versuchsw. Osterr., 15 (1912), No. 1, pp. 107–119; Monatsh. Landw., 5 (1912), No. 1, pp. 1–8*).—This is a review of the present status of the manufacture of ammonium sulphate, nitric acid, lime nitrogen, and nitrids, describing briefly the principal processes which have been proposed for this purpose and have shown commercial possibilities. The author is of the opinion that among these are processes which can be profitably used whenever there is commercial necessity for supplementing present supplies of nitrogenous fertilizers.

Some recent experiments with calcium cyanamid or nitrolime, and their practical bearing (*Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 3, pp. 649–657*).—This is a summary of the more important results of the principal recent investigations on this subject, with a bibliography of 18 references.

Marl for soil improvement from various formations in Hanover, A. ROSENBACH (*Jour. Landw., 59 (1911), No. 4, pp. 407–418; abs. in Chem. Abs., 6 (1912), No. 5, p. 663*).—Attention is called to the variation in the use of the term marl, and it is pointed out that many so-called marls contain a very small amount of lime and owe their fertilizing value chiefly to their phosphoric acid content. This is true of a large number of marls and associated deposits from the region of Göttingen, of which analyses are reported.

The sootfall of London: Its amount, quality, and effects (*Lancet [London], 1912, I, No. 1, pp. 47–50, fig. 1*).—This article reports observations on the amount and character of soot falling in London, from which it is estimated that on the 117 square miles comprising the administrative county of London, including the city proper, there is an annual sootfall of 76,050 tons containing 6,000 tons of ammonia, 8,000 tons of sulphate (SO_4), and 3,000 tons of chlorin as chlorids.

Fertilizers: Their source, purchase, and use, C. B. SMITH (*Redlands, Cal., 1911, 2. ed., rev. and enl., pp. 67, pls. 2, figs. 2*).—This is a second revised and enlarged edition of this book, which, it is stated, was "written for the use of farmers and fruit growers, with special reference to citrus culture."

Fertilizers in 1912, C. GUFFROY (*Vie Agr. et Rurale, 1912, No. 10, pp. 233–240*).—A brief review is given of progress in fertilizer investigations in 1912, more particularly those relating to the fertilizing effect of manganese, sulphur, magnesium, chlorin, sodium chlorid, boron, chromium, and radioactive minerals, soil inoculation, rôle of water in plant growth, standard and new nitrogenous fertilizers, phosphatic and potassic fertilizers, lime, gypsum, and manure, as well as those bearing on the use of fertilizers against plant parasites and diseases.

Inspection and analyses of commercial fertilizers, P. F. TROWBRIDGE ET AL. (*Missouri Sta. Bul. 99, pp. 117–181*).—Analyses and valuations of 838 samples of fertilizers inspected during the spring and fall of 1911 are reported.

Commercial fertilizers (*Off. Rpt. Sec. Ohio Bd. Agr. on Com. Ferts., 1911, pp. 208*).—This is a report of the official fertilizer inspection in Ohio in 1911, giving the text of the fertilizer law which became effective December 1, 1911, and analyses and valuations of 695 brands of fertilizers examined during the year, with discussions of the results and of the nature, purchase, and use of fertilizers.

Tabulated analyses of commercial fertilizers, W. FREAR (*Penn. Dept. Agr. Bul. 218, pp. 77*).—This bulletin gives the results of fertilizer inspection, including analyses and valuations, in Pennsylvania from August 1 to December 31, 1911.

Licensed commercial fertilizers, 1912, F. W. WOLL (*Wisconsin Sta. Circ. Inform. 31, pp. 12, 13*).—A list of manufacturers and brands licensed for the year 1912.

AGRICULTURAL BOTANY.

The function of manganese in plant growth, W. P. KELLEY (*Hawaii Sta. Bul. 26, pp. 7–41*).—A study has been made of the function of manganese in plant growth, in which the author, after describing its occurrence in plants and reviewing previous investigations, gives accounts of field and pot cultures with different plants, the principal observations being made with pineapples.

It was found that different species of plants vary decidedly when grown on manganiferous soils. Some are stunted in growth and die back from the tips of the leaves, while others appear unaffected and so far as can be determined vegetate normally in the presence of manganese. Microscopic investigations showed that certain changes take place in the protoplasm of the cells, the chlorophyll in a number of plants being affected. In pineapples it undergoes complete decomposition, the chloroplasts often becoming disintegrated and losing their granular structure. Simultaneously with the destruction of chlorophyll starch formation ceases. The occurrence of oxidizing enzyms in plants appears to bear no direct relation to the destruction of chlorophyll under the influence of excessive amounts of manganese, and there seems to be no correlation between the phenomenon of chlorosis in pineapples and the activity of the oxidizing enzyms.

From ash analyses it was found that manganese was absorbed in considerable quantities, and that the ratio of absorbed lime to magnesia increased under the influence of manganese, regardless of whether the plant exhibited any toxic effects. The author believes that the effects of manganese are largely indirect and are to be explained on the basis of its bringing about a modification in the osmotic absorption of lime and magnesia. The toxic effects are chiefly due to this modification, rather than as a direct effect of the manganese itself.

Where small amounts of manganese occur in natural soils it is believed that a twofold function in plant growth is performed. The manganese acts catalytically, increasing the oxidations in the soil and accelerating the auto-oxidations in plants, and it tends to modify the absorption of lime and magnesia by partially replacing calcium from insoluble combinations and through a direct effect on the osmotic absorption of lime and magnesia.

The absorption of phosphoric acid by plants grown on manganiferous soil was found to be decreased, possibly due to the precipitation by the manganese of the phosphoric acid into a difficultly soluble compound.

The application of lime to manganiferous soils was found to result in a more intense yellowing. On the other hand, the application of soluble phosphates tends to ameliorate the effect of an excess of manganese. In practice this is the only means known to be efficacious, but in the case of pineapples it does not entirely prevent the development of the yellow color.

The form in which manganese is absorbed is not definitely known, but it is suggested that it is probably as a manganite of calcium.

The influence of manganese on the growth of Aspergillus niger, G. BERTRAND and M. JAVILLIER (*Bul. Soc. Chim. France, 4. ser., 11 (1912), No. 5, pp. 212–221*).—In continuation of previous investigations by the authors on the effect of manganese, zinc, etc., on plants (E. S. R., 25, p. 325), a study is reported on the action of manganese on the growth of *A. niger* in cultures, special efforts having been made to remove all traces of zinc, sulphur, etc., from the manganese. Varying proportions of manganese were added to Raulin culture media and the effect on the growth of the fungus was observed. The amount of manganese was varied from 1 part per million to 1 part in 50. In all the experiments there was found a stimulating effect that rapidly increased

with the concentration to an optimum, after which the growth was gradually reduced.

In a second series of experiments an attempt was made to determine the assimilation of manganese by the fungus. It was found that the increased weight of the mold was due not only to the manganese assimilated but also to the stimulating effect the chemical produced on the assimilation of other compounds by the fungus.

The amount of manganese fixed was found quite small in proportion to the total amount at the disposal of the plant, and it did not appear to be of physiological use within the cells. It either simply colored the cell wall or was changed into insoluble forms. The greatest stimulation to growth appeared when manganese was used in the proportions between 1 part to 10,000 and 1 part to 500. The manganese appeared to stimulate the production of conidia, as shown by differences in color of the growth on the media.

The stimulating action of manganese and copper sulphates on plants, L. MONTEMARTINI (*Staz. Sper. Agr. Ital., 44 (1911), No. 7, pp. 564–571; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 11–12, pp. 2467, 2468*).—A study has been made of the effect of very dilute solutions of the sulphates of manganese and copper on the development, respiration, and photosynthesis of grapes, lupines, beans, and potatoes, and the flowers of Leucanthemum and Ageratum. Comparisons were drawn between the carbon dioxid liberated and the proportion of the different substances absorbed by the plants. The manganese solutions varied from 0.001 to 0.025 per cent and the copper sulphate from 0.005 to 0.05 per cent.

The results show that when these salts were absorbed by the plants in very small quantities both exerted a stimulating effect on the growth of all the plants. Marked differences were noted in the sensitiveness of the different plants, as shown by their respiration. Grapes were the most sensitive, followed by beans and potatoes in the order enumerated. The flowers of plants were found to exhibit more sensitiveness to the chemicals than the leaves. Unopened flowers were more sensitive than open ones. Photosynthesis was stimulated more than respiration, and it varied to some extent with the different plants.

The growth of wheat seedlings as affected by acid or alkaline conditions, J. F. BREAZEALE and J. A. LECLERC (*U. S. Dept. Agr., Bur. Chem. Bul. 149, pp. 18, pls. 8*).—A report is given of a physiological study to determine the effect of the reaction of the culture medium on the growth of wheat seedlings and particularly on the development of the root. Seedlings were grown in water cultures containing various amounts of sodium nitrate, potassium chlorid, potassium sulphate, hydrochloric acid, and sulphuric acid, singly and in combination with calcium carbonate. Two crops of seedlings were grown in the solutions, and the effect on germination was noted. Another series of experiments was conducted in which aluminum and ferric hydroxids were used to reduce the acidity of the solution, and still another series in which clover and timothy were grown in connection with wheat.

The investigations show that the seedlings grown in culture solutions containing potassium chlorid, potassium sulphate, or hydrochloric or sulphuric acid solutions (10 parts per million) exert a selective action whereby the potash ion is absorbed by the roots and the chlorid and sulphate ions are for the most part left in solution. This causes the solution to become acid, which in turn acts injuriously on the root development. The addition of iron or lime or aluminum hydrate to the media containing the other compounds used tended to keep the solutions alkaline so that they acted favorably on the root development.

New studies on narcosis in plants. O. RICHTER (*Mitt. Naturw. Ver. Univ. Wien, 9 (1911), No. 1, pp. 14, 15; abs. in Bot. Centbl., 116 (1911), No. 24,*

p. 616).—The author gives the results of his investigations on plants regarding the differences observable in chemical composition, etc., between plants exposed to an atmosphere of narcotics and those in air. These in the main may be summed up as follows: Plants in a narcotic atmosphere show (1) increase of soluble, osmotically active compounds, as sugar, asparagin, etc.; (2) heightened turgor; (3) cells growing in a form shorter but thicker with other cell modifications, as increase of collenchyma, epidermal thickenings, vacuolization and fusion of cells, etc.; (4) lessened synthesis of proteins and coloring matters; (5) alterations of negative geotropism; and (6) increase of heliotropic sensitiveness.

The stimulation of plants through small quantities of poisonous substances, E. B. Fred (*Centbl. Bakt. [etc.], 2. Abt., 31 (1911), No. 5–10, pp. 185–245, figs. 4; abs. in Jour. Chem. Soc. [London], 100 (1911), No. 590, II, p. 1123*).—A detailed account is given of experiments in which ether, carbon bisulphid, potassium bichromate, copper sulphate, and Salvarsan were tested on various organisms. It was found that their effect is a biological one and that when used in sufficient dilutions they promote the growth of Azotobacter and of denitrifying, ammonifying, and various putrefactive bacteria and yeasts.

Ether in a suitable quantity increased the nitrogen fixation by Azotobacter in soils, and both ether and carbon bisulphid increased nitrogen fixation in pure cultures, but not so much as in mixed cultures taken directly from soil. This is probably due to Azotobacter's possessing a greater resistance to the chemical materials used than the other organisms; the energy which the second class of organisms would use thus goes to aid in the development of the more resistant forms. The growth of denitrifying bacteria was retarded through the presence of the antiseptics, although there was ultimately a small increase in total production. Denitrification, it is claimed, plays no important rôle in normal soil where there is no pronounced source of carbon present.

In ordinary soils nitrification was for a time retarded by the application of ether, but later it was considerably increased. The stimulating effect of ether and carbon bisulphid on the growth of plants in sterile soil was demonstrated.

In conclusion the author states that the beneficial effect of the substances tested is due to their stimulating action on the plants themselves as well as the effect they exert on the lower organisms.

An extensive bibliography is appended.

Action of carbon bisulphid on germinability of grain, A. Morettini (*Staz. Sper. Agr. Ital., 44 (1911), No. 5–6, pp. 417–422*).—The author conducted a series of experiments to determine the injury to germinability of grain caused by the application of carbon bisulphid vapor for the purpose of combating injurious insects. Two lots of grain were employed, the germinability of which was from 99 to 100 per cent before treatment.

In a series of exposures to the vapor lasting from 1 to 60 days the germination decreased from 92 to 0.5 per cent for one kind of grain, and from 89 to 15 per cent for the second. Smaller quantities of the gas caused less injury. The smallest quantity that was effective as an insecticide was about 31.55 gm. of the poison per hectoliter of grain. This could be continued for 16 days without reducing the germinability below 98 per cent, and after 100 days it was not below 95 per cent. About 35.9 gm. per hectoliter is considered a safe proportion to employ for a period necessary to protect the grain.

The action of carbon bisulphid on the germination of wheat, P. Fantechi (*Staz. Sper. Agr. Ital., 44 (1911), No. 7, pp. 515, 516*).—Attention is called to experiments made by the author in 1900 upon the effect of carbon bisulphid on the germinability of wheat. He claims to have found that the vapor of carbon bisulphid as commonly used to destroy insects in stored grain did not

affect the germinative faculty of the grain. When seed were immersed for 2 seconds in carbon bisulphid and afterwards placed in the air, the germination of about 10 per cent was destroyed. Immersing seed for a minute and allowing them to remain in a vapor of carbon bisulphid for 24 hours destroyed about half of the seed. The action of the vapor was found to be greatly influenced by temperature, 30° C. causing a depreciation of at least 50 per cent in germination, and at 40° all seed were destroyed.

Treatment of seeds with hydrogen peroxid, E. Miège (*Card. Chron., 3. ser., 50 (1911), No. 1292, p. 241; Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 11–12, p. 2600*).—A brief account is given of investigations which show that dilute solutions of hydrogen peroxid facilitated germination and stimulated the active development of plants.

The author concludes from his experiments that hydrogen peroxid is a useful fungicide for treating seed affected by smut. Immersion of infected seed for 15 minutes in a 1 per cent solution is said to have not only destroyed the adhering fungus spores but to have also protected seedlings against subsequent attack. It is thought that this fungicide might be efficient for the control of hollyhock rust.

Hydrocyanic acid formation in germination of seeds, C. Ravenna and C. Vecchi (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 20 (1911), II, No. 9, pp. 491–495*).—This investigation follows up work previously noted (E. S. R., 24, p. 229), experiments being carried on with seeds of flax and sorghum.

In flax seeds which normally contain a minute quantity of hydrocyanic acid the proportion was considerably increased on germination, and this increase was augmented upon the addition of 0.1 per cent of chlorid of ammonia to the water with which the seeds were moistened. In experiments with sorghum seeds, which in the quiescent state contain no prussic acid, this acid was produced by germination, and as before, its amount was augmented by the addition of sal ammoniac. In one experiment the addition of glucose (0.2 per cent) gave a greater percentage of this acid than did sal ammoniac, while a still greater proportion was obtained by employment of both together in the percentages above mentioned.

Investigations on the germination of seeds of some weeds, O. Munerati and T. V. Zapparoli (*Staz. Sper. Agr. Ital., 44 (1911), No. 1, pp. 40–50*).—The effect of chemical and mechanical means of rendering seed coats of seed permeable was investigated. Different lots of seed of a number of common weeds were either immersed in strong sulphuric acid (specific gravity 1.84) or punctured with a needle opposite the embryo.

Among the so-called refractory seeds, soaking for from 15 to 90 minutes in sulphuric acid or puncturing the seed rendered the seed coats more permeable to water and hastened germination, though in some cases the total germinations of the untreated seed were the greatest. For the seed having thinner seed coats considerable injury followed the treatments. In a number of instances the germination of old seed was higher when treated with sulphuric acid than in the case of untreated lots.

Dependence of the respiration of plants on the lipoids, E. Stanevich (*Trudy Imp. S. Peterb. Obshch. Estestvo. (Trav. Soc. Imp. Nat. St. Petersb.), 41 (1910), pp. 17–33; abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landic.), 12 (1911), No. 1, p. 110*).—The author examined the respiration of wheat germs after extraction with various solvents (E. S. R., 25, p. 124). The quantities of carbon dioxid given off by 3 gm. of the embryos in 9 hours after the extractions were as follows: Control 163 mg., extracted with toluene 81.8 mg., acetone 79.8 mg., chloroform 61.4 mg., ether 43.0 mg., and alcohol 6.3 mg.,

showing a close relation between the extracted lipoids and the amount of carbon dioxid set free.

The fermentation of "hefanol" is more depressed by alcohol than by acetone.

Some recent investigations on the formation of starch in plant cells, A. GUILLIERMOND (*Compt. Rend. Soc. Biol. [Paris], 72 (1912), No. 7, pp. 276–279, figs. 9*).—It is claimed that a study of starch formation in potatoes, in the roots of *Phajus grandifolius*, and in other plants indicates a mitochondrial origin and that the leucoplasts of Schimper are identical with the chondriosomes of animals. Further studies are claimed to show that in plants starch is a direct result of the activity of the chondriosomes.

Glycogen in phanerogams and its relation to oxalate of lime, J. POLITIS (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 20 (1911), II, No. 8, pp. 431–439*).—Studies were made on *Orchis morio*, *Bletia hyacinthina*, *Pitcairnia xanthocalyx*, and *Billbergia nutans*.

The author found glycogen to exist in several phanerogams, as well as in the few cryptogams in which it is asserted to be confined. The mucilage of the tubers of Orchis is asserted to be composed chiefly of glycogen. In the phanerogams examined by him glycogen was formed only in the cells containing oxalate of lime in the form of raphides, from which fact he infers some relation existing between the carbohydrate and the salt in question.

Origin and office of oxalate of lime in plants, J. POLITIS (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e. Nat., 5. ser., 20 (1911), II, No. 9, pp. 528–534*).—This article, after summing up the conclusions of various other investigators bearing upon these points, gives the conclusions drawn from the author's own work briefly as follows: Oxalic acid, with its resulting calcium oxalate, has its origin in the cell in which the salt is found in crystalline form, and the acid is formed by oxidation of glycogen or amyloids.

The views of various others as to the office of the salt are given.

Essential oils and other volatile plant products as the cause of sap movements, I. GIGLIOLI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 20 (1911), II, No. 8, pp. 349–361; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 591, II, p. 79*).—These investigations appear to be one phase of a more general study by the author of water movement in living tissues. Besides giving consideration to the work and reports of some others in the same field, he presents the results of his own researches with various volatile substances in regard to their influence on movement of water in the case of fruits, potatoes, fresh wood, etc.

It was found that in several cases, notably that of cactus in chloroform vapor, the movement of water from the plant and presumably through its interior tissue was considerably increased by the presence of a volatile body. The suggestion is made that such products in the plant tissues may be a more or less important modifying factor in transpiration and related processes.

Formation of alkaloids in tobacco, C. RAVENNA and V. BABINI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 20 (1911), II, No. 8, pp. 393–398*).—This is a report of investigations in close relation to those carried on by G. Ciamician and C. Ravenna (E. S. R., 25, p. 634), M. Treub, and others cited. Tobacco plants in 5 groups were grown in nutritive solutions differing only as to the presence or absence of calcium nitrate (0.1 per cent) and of glucose (2 per cent), and under other conditions alike except as to the admission or exclusion of light.

It was found that the maximum percentage of nicotin in terms of the plant's original weight was obtained by the plant from the solution containing glucose in light; the minimum from the same solution in darkness. The difference is

ascribed to the arrest of the formation of the alkaloid when the plant is grown in darkness.

Heliotropism in radium illumination, H. Molisch (*Sitzber. K. Akad. Wiss. [Vienna], Math. Naturw. Kl., 120 (1911), I, No. 4, pp. 305–318, figs. 5; abs. in Ztschr. Bot., 4 (1912), No. 2, p. 151*).—This is a continuation of work taken up several years ago by the author on radium and heliotropism of plants (E. S. R., 17, p. 752) in which only negative results were obtained, owing presumably to weakness of the radium preparation employed.

He now concludes that radium of strong illuminative power exposed at short distances is capable of producing in heliotropically very sensitive plants a positive tropism. This is true of the young seedlings of oats (*Avena sativa*) and vetch (*Vicia sativa*), but barley (*Hordeum vulgare*) and sunflower (*Helianthus annuus*) are not sufficiently sensitive to respond to radium illumination so far as tried. The α, β, and γ rays seem to check the longitudinal growth of the plants, also to shorten the period of spontaneous nutation, limit the synthesis of anthocyanin, and in some cases produce other injurious effects on plants which are very sensitive to its action.

Investigations on Mucorineæ and their relations to soil, O. Hagem (*Vidensk. Selsk. Skr. [Christiania], Math. Naturv. Kl., 1910, No. 4, pp. 152; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 11–12, pp. 2475–2477*).—Studies by the author and others have shown about 30 species of Mucorineæ present in the soil and that they constitute an important element in the fungus flora of soils. Most of the species identified belong to the genera Mucor, Absidia, and Zygorhynchus. The distribution of the species seems to vary with different soils, those in cultivated soils differing from the species present in the soil of coniferous woods. While the relation of the Mucorineæ to mycorrhiza has not been established, it appears that there is a close relationship between the species present in the soil and those found occurring as mycorrhiza on roots. Both obligate and facultative parasites are found among these soil molds, but in most soils the facultative parasites predominate. Some species seem to be obligate parasites on higher fungi, as the agarics, and most of these belong to the genera Spinellus, Dicranophora, and Sporochinia.

The nitrogen, carbon dioxid, acid, and temperature relations of the different groups were studied. Only a few species were found to have any considerable effect on the nitrogen balance of soils through their action on nitrites and nitrates. Their importance, so far as the nitrogen balance is concerned, depends on the transformation of the ammoniacal nitrogen into a stable form which is useless to higher plants. The aminic and amidic nitrogen of the various organic substances in the soil is transformed by some of the species into ammoniacal nitrogen, a part of which is transferred into stable forms, while the other part circulates through the soil and can be utilized by higher plants.

The investigations showed that the Mucorineæ in general, and especially the soil forms, could not attack many carbon compounds, particularly cellulose and hemicellulose, although they could change various saccharin and pectin substances.

The temperature limits for the growth of most species lie between 7 and 33° C., with optima of from 20 to 25°.

An extended bibliography is given.

The slime or gum of Rhizobium leguminosarum, R. Greig-Smith (*Centbl. Bakt. [etc.], 2. Abt., 30 (1911), No. 21–24, pp. 552–556, fig. 1*).—This is a short account of work, the results of which were previously published elsewhere (E. S. R., 18, p. 1031). The author here describes briefly his methods of obtain-

ing and examining the gums and records some results which may be stated in substance as follows:

Five gums were obtained from five morphologically similar bacteria. They produced the same gums from sugar. There appears to be a probability that the plant tissues utilize the gum for building up their nucleoprotein. The location of the bacteria in the plant appears to have a distinct bearing upon their physiological activity. The optimum quantity of saline matter required for formation of slime is small, from 0.1 per cent to 0.2 per cent, approximating that found in soil water. Rhizobium is capable of fixing atmospheric nitrogen under conditions that favor slime formation, and between these two processes there appears to exist a somewhat regular quantitative relation.

The author was not able to confirm the view previously advanced by him that Rhizobium is a yeast. It appears to be a compound bacterium and consists of cocci contained in a straight or branching, tubular capsule. The cocci divide both transversely and longitudinally and the capsule, consequently, assumes sometimes a γ or Y form. The majority of the bacteria in a nodule are found to be dead.

FIELD CROPS.

[Field crops at the Hawaii Station], W. P. Kelley, E. V. Wilcox, and C. K. McClelland (*Hawaii Sta. Rpt. 1911, pp. 9, 51–63, pls. 2*).—Earlier field crop work at this station has already been noted (E. S. R., 25, p. 328).

Cooperative fertilizer experiments with taro indicate "that this plant, like rice, is benefited by allowing the soil to dry out and become aerated between crops, by applying all of the fertilizer before planting rather than after planting or in fractional doses, and by using sulphate of ammonia rather than nitrate of soda as a source of nitrogen.

At Kunia and Waipahu applications of (1) dried blood, superphosphate, sulphate of potash, and lime, and (2) dried blood, dicalcic phosphate, and sulphate of potash were followed by higher average cotton yields during 1909–10 than were secured from the same components and nitrate of soda, ammonium sulphate, and basic slag in various mixtures. The fertilizers were so applied as to supply 20 lbs. of nitrogen, 50 lbs. of phosphoric acid, and 30 lbs. of potash per acre. From the data presented the author concludes that the soil is most in need of phosphates and that dicalcic phosphate appears more effective than other forms. Potash and nitrogen produced little effect unless applied with phosphates. Lime applied alone appeared ineffective.

When 2 crops of rice per year were grown the yields gradually decreased if fertilizer was applied to the spring crop only, but were maintained when ammonium sulphate was applied to each crop before planting. The superiority of the sulphate to nitrate of soda has been previously noted (E. S. R., 26, p. 41).

In a test of rice varieties newly imported from Japan the average yields from the spring crop of 1910 ranged in the following order: Omachi, Shinriki, No. 153 (old variety), Benkei, and Miyako, and tests in the fall of 1910 and spring of 1911 were in general conformity. Only Miyako was produced in sufficient quantity for a culinary test, and this is said to cook as well as imported Japanese rice and to hold its moisture as the Hawaiian rice does not. In taste and appearance, but not in oily strength, it is said to equal the native Japan rice. Two variations were noted in the growth of these rices. Benkei developed a heavy tillering habit which Shinriki appears to have lost, and Omachi, a bearded rice, became almost entirely beardless. If Omachi does not deteriorate it is believed to be the rice to grow in Hawaii.

In a cooperative test of cotton variation at Waipahu the following lint yields per acre were secured: Chinese upland 180.83, Egyptian 115, Sea Island 54.66, and Caravonica 25.37 lbs. The location appeared unfavorable, as only about 40 per cent of a stand was reported and the bollworm took about 30 per cent of that. The damage to the upland cotton was less than that suffered by the other varieties. In another test transplanted Caravonica seedlings gave better results than those not transplanted.

At the station Caravonica cotton yielded at the rate of 165.9 lbs. of lint per acre and produced fibers ranging from 1 $\frac{5}{8}$ to 1$\frac{7}{8}$ in. in length. A brief progress report is given of date of pruning and pinching back tests, together with a statement of the theory on which these tests were conducted. The cotton was picked as it matured from the branches that had been pruned. Strength tests of the fibers showed that they had decreased from 8.99 gm. to 6.24 gm. in breaking strength. The more immature the fiber at pruning time the lower its breaking strength when tested. Individual plants yielded from 0.33 to 2.73 lbs. of lint per plant.

The use of a lantern placed above a pan of water and kerosene in the field at night and the regular cutting off and burning of infested bolls reduced the percentage of bollworm infestation from 68 per cent at the first picking to 50 per cent at the second and 26 per cent at the third picking.

Sea Island cotton yielded at the rate of 395 lbs. of lint per acre and produced fibers ranging from 1$\frac{5}{8}$ to 1$\frac{15}{16}$ in. in length in spite of a 20 per cent loss due to insects. Poisoned bran placed in small circles about the hills prevented damage from cutworms.

On December 31 the plants were pruned back to stumps, some high and some low. The growth invariably appeared near the ground, indicating that Sea Island cotton grown as a perennial should be pruned low.

Immature fiber picked from plants that had been pulled was found to contain a large amount of nep, immature fiber, and excessive waste. The yarn was too weak for thread.

A number of crops were planted for the purpose of determining their profitableness in Hawaii. Peanuts did well and were in one case planted between cotton rows. Broom corn yielded at the rate of from 95.4 to 501.6 lbs. of brush per acre. Other crops tested were corn, saccharin and nonsaccharin sorghums, and a new legume called guar.

[Rotation and fertilizer tests], H. J. EUSTACE and V. M. SHOESMITH (*Michigan Sta. Rpt. 1911, pp. 183, 184; 212–221*).—This is mainly a report of tests begun in 1891.

During the first 5 years all plats were uniformly cropped to determine their relative fertility. Tables present data from which the author concludes that aside from the matter of profit a wheat-clover rotation is somewhat better in effect on soil fertility than a wheat-clover-corn or a wheat-clover-potato rotation, but the differences are not marked. Plats which had been continuously planted to wheat and corn were inferior in producing power to those on which clover had been grown in rotation. Beans grown each season with rye seeded in the fall and turned under in the spring were followed by 21 per cent greater yields than a continuous cultivation of corn and 29 per cent greater than was secured from the plat planted continuously to wheat. Continued cropping to orchard grass was followed by a 21 per cent greater yield than was a wheat-clover rotation. This is attributed to the heavy root system and the plant food which it stored.

In one series plats fallowed for 10 years produced more than any others of the series except those seeded to orchard grass, but when the averages of 2 series were considered fallow was excelled by a wheat-clover rotation.

A second portion of this long period experiment was devoted to tests of commercial fertilizer. The plats were planted in uniform croppings from 1891 to 1898. Tables state in detail the yields secured during 1899–1905. During this period stable manure, acid phosphate, nitrate of soda, muriate of potash, and a mixed commercial fertilizer were tested singly and in various mixtures for beets, potatoes, corn, oats, wheat, beans and turnips, but no conclusions are drawn.

The horticulturist reports better potato yields following a mixture of 194 lbs. of nitrate of soda, 357 lbs. dried blood, 1,000 lbs. of acid phosphate, 400 lbs. of sulphate of potash, and 49 lbs. of filler applied at the rate of 500 lbs. per acre than were secured from the use of a complete potato fertilizer or a mixture of 570 lbs. of dried blood, 1,000 lbs. of acid phosphate, 400 lbs. sulphate of potash, and 30 lbs. of filler.

Cooperative grain investigations at McPherson, Kans., 1904–1909, V. L. Cory (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 240, pp. 22*).—This is a report of work carried on in cooperation with the Kansas Station.

Among the winter wheat varieties tested Turkey, Kharkof, and Crimean produced the highest 4-year-average yields, 25.9, 24.53, and 23.88 bu. per acre, respectively. Three varieties planted about the middle of September, 1905, gave an average yield of 7.78 bu. per acre as compared with 20.46 bu. secured from the same varieties planted about a month later.

Among barley varieties tested Caucasian, Yenidje, and Odessa produced the highest 4-year average yields, 30.32, 28.57, and 28 bu. per acre, respectively. Among varieties of oats tested Sixty Day and Seventy-five Day gave 4-year average yields of 37.56 and 36.54 bu. per acre, respectively. Among the other grains tested Proso proved a failure in all trials, but a few varieties of non-irrigated rices were promising. Kubanka wheat gave a 4-year average yield of 13.43 bu., Black Winter emmer 52.16 bu., winter einkorn 19.85 bu., spring einkorn 22.8 bu., and Red Winter spelt 46.8 bu. per acre. Each of 3 winter ryes tested yielded 19 bu. or over per acre.

Buckwheat gave fair results, the Sando Soba variety of the Japanese type apparently being the best of the 12 or 15 varieties tested. Chinese buckwheats are hardier and more drought resistant but longer in maturing. Plantings during the third and fourth weeks of April gave better results than those made at earlier or later dates.

The author states that the suspension of seed for 15 minutes in a solution of 1 lb. of formalin to 50 gal. of water will prevent oat smut, the stinking smut of wheat, and the covered smut of barley, but caused no appreciable diminution in the loose smuts of wheat or barley. A modified hot-water treatment used was applied by soaking wheat and barley in cold water for 7 hours and then treating for 15 minutes at 54 and 52° C. respectively, and 10 minutes treatment of oats at 57° without soaking. In the crop following these treatments there was no smut in the oats, no loose smut in the wheat, and in case of the barley only a trace of loose smut in 3 varieties.

Studies of the principal buckwheat species, E. Miège (*Recherches sur les principales espèces de Fagopyrum. Paris, 1910, vol. 1, pp. 426; rev. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 5, pp. 1054, 1055*).—This volume presents a comprehensive study of buckwheat species and varieties. The author gives measurements and 1,000-kernel weights for use in distinguishing the 4 species *Fagopyrum esculentum, F. tataricum, F. stenocarpa*, and *F. emarginatum*, and for distinguishing 6 varieties of *F. esculentum*. A review of the status of buckwheat growing in the world's agriculture is followed by discussions as to the production and improvement of the crop.

The condition of Kansas seed corn, E. G. SCHAFER (*Kansas Sta. Circ. 22, pp. 3*).—After a long dry period in the summer of 1911 more favorable conditions came in the fall. Corn renewed its growth and at the time of the early freezes contained a high percentage of moisture. Among thousands of ears of seed corn received from farmers in different parts of Kansas, the station's average test has been "about 75 per cent good." In view of these facts this circular gives suggestions on the purchase of seed corn, the germination test, the individual ear test, and the preparation of land for planting.

The seed corn situation, C. G. WILLIAMS (*Ohio Sta. Circ. 121, pp. 117–120*).—A discussion of the advantages of testing is followed by directions for the use of the germination test of seed corn.

Some data for oat growers, L. C. BURNETT (*Iowa Sta. Bul. 128, pp. 93–127, figs. 5*).—Earlier oat experiments have already been noted (E. S. R., 19, p. 1034).

A key to oat varieties based upon the work of J. B. Norton and a classification of oats for shows precede tables reporting the results of tests of 48 commercial oat varieties as to date of ripening, height, percentage of lodging, the yield per acre, and the weight per bushel during 1908, 1909, and 1910. Averages for this period, for the 5-year period 1906–1910, and the 7-year period 1904–1910 are given where possible. Among 7 common Iowa varieties, Kherson gave a 7-years' average yield of 55.9 bu. per acre, or 7.5 bu. more than the average of the standard varieties, and was excelled in early ripening qualities only by the Early Champion and White Alaska. Silver Mine averaged 52.3 bu. per acre but averaged about 8 days later in ripening.

Iowa's 1907 oat crop showed very light weight per bushel and yield. The heaviest and best seed obtainable of 20 leading varieties was purchased from outside sources for comparison with the light home-grown seed during 1908. The average results are indicated by the following figures, the data for the home-grown seed being stated first: Weight of seed per bushel as sown 25½ and 33 lbs., number of seeds sown per acre 2,443,000 and 1,829,000, leaf-rust 16.7 and 18.9 per cent, stem rust 26.7 and 26.8 per cent, lodging 11 and 16 per cent, yield per acre 31.2 and 31.5 bu., weight of crop per bushel 22.1 and 22.2 lbs. The average date of sowing was April 19, and the average date of ripening July 25. All plats were sown at the rate of 3 bu. per acre. In case of 12 varieties the light acclimated seed outyielded the heavy imported seed, in 7 cases the heavy seed outyielded the light, and in one case the yields were equal. "Some of the plats with heavy seed may have been underseeded. The figures tend to show that the heavy seed and light seed were about equal pound for pound, but not seed for seed, nor measure for measure."

Six bu. of Kherson and Silver Mine oats were taken just as they came from the thrashing machine and divided into 4 samples of each variety, a check sample and samples fanned 1, 2, and 3 times each, respectively. Each fanned sample was again divided and used in sowing so that each of 4 plats of each variety received the same number of pounds of seed, while other plats were given the same number of seeds, as nearly as the drill could be calibrated to accomplish this result. In 9 different tests the unfanned oats never excelled the fanned samples in yield, but the samples fanned 3 times rarely yielded more than those fanned once or twice.

A Wyoming-grown sample of oats of Irish Victor stock, which won the championship at the Portland Exposition, was sown in 1907 and 3 succeeding years for comparison with other Irish Victor seed. In the 4 years it never equaled the parent stock, but approached it at a rate which if continued in the future would make it equal the older stock within 2 more seasons. In 1907 new varieties were purchased, which showed such variations that the seed of each variety

was retained each season for further sowing as a separate variety, for example, Probesteier 1907, Probesteier 1908, etc., indicating the first season in which the variety was grown at Ames from the stock so designated. Tables present the economic portion of the notes taken on this test of seed of different degrees of acclimatization. Another table compares the first, second, and third crops after importation of the seed obtained from the British Isles and various stations. The author notes that the British seed, the normal date of ripening of which is late in August was damaged less and less in each succeeding generation by the changed conditions, consequently the second crop exceeded the first and was exceeded by the third in yield. Seed from central Illinois yielded 52.6, 52.7, and 52.2 bu. per acre for the 3 crops. The small rise in the second crop is so frequent as to be important, in the author's opinion, although its frequency is less than 50 per cent. He concludes that "short-seasoned territories produce oats better adapted to a longer-seasoned territory than the ones usually grown there," but that "as a whole the imported seed is not better than the average home-grown seed."

Although the seed sold under a given name does not conform to a single type of plant, or always contain a limited number of types in the same proportion, it is stated that "at the Iowa Station it is not considered that this point seriously affects yield or weight per bushel." In 1910 only 4 of 19 new importations yielded as well as the same varieties that had been acclimated for 1 or 2 years. The loss in yielding power appeared to be directly proportional to the degree of change of environment. The increase in yield was most marked in the second crop, and quality of seed appeared less important than acclimatization. Where importations appeared successful the increase arose from securing a better adapted variety rather than from the quality of seed.

In 4 years' tests drilling and broadcasting gave average yields of 40.7 and 36.9 bu. per acre, respectively, and wherever the land is dry enough to permit, drilling is recommended.

A table states the results of a 6-years' test of rates of seeding Kherson and Silver Mine oats. During the 4-year period 1908–1911 Kherson yielded more heavily after seeding at the rate of 4½ bu. per acre than at any lighter rate, but Silver Mine sown at the rate of 4 bu. per acre yielded much more heavily than any higher or lower rate tested.

The Chicago grades of oats are stated and suggestions made as to needed improvements in methods of oat production in Iowa.

Composition of oats as affected by fertilization, hilling, and rate of seeding, W. EBERT (*Mitt. Landw. Inst. Leipzig, 1911, No. 10, pp. 3–88*).—The author reviews the literature of the subject, with frequent citations and a bibliography of 123 titles, and from a considerable amount of data, gathered in his own tests, he draws the following conclusions:

Variation in rate of sowing influences the composition of oats more than does variation in any other cultural practice tested. Thin sowing increases root development, tillering, length of panicle, number of spikelets, and weight per panicle and per 1,000 kernels, and reduces the chaff percentage. Both grain and straw are increased in dry substance and protein content, the chaff is increased in dry substance and varies in protein content, and ether extract and crude fiber decrease.

Fertilization showed the next greatest influence, producing an increased root development, tillering power, length of straw, length and weight of internode, length and weight of panicle, number of spikelets, and whorls, and 1,000-kernel weight, and reducing the chaff percentage. It apparently increased the protein

content of straw and chaff and the dry matter content of the grain, but reduced the ether extract and crude fiber in the grain.

Hilling increased root development, but gave no corresponding increase of tillering power. It increased the weight per haulm and per internode, but showed varying results as to length of both. With some exceptions it lengthened the panicle and the number of whorls. It increased the 1,000-kernel weight, chaff percentage, crude fiber of the grain, and the protein percentage of the straw. As the hilled plats fell below the unhilled in both gross and net income, the author concludes that hilling is valueless, but notes that these results may be attributed to the fact that the condition of the soil prevented hilling at the proper time.

Rice—A possible new industry for California, G. W. SHAW and A. J. GAUMNITZ (*California Sta. Circ. 74, pp. 26, figs. 7*).—This circular reports studies made in order that inquiries as to the possibility of developing the rice industry in California might be intelligently answered. General discussions of rice culture and its soil requirements and directions for the production of the crop are followed by tables and descriptive text stating the results of variety and irrigation tests on a number of California farms.

Analyses of water from a spot where rice was growing satisfactorily and from another where it appeared to be seriously affected by the alkali gave the following results, the first percentage in each case being that for the water which was apparently producing injurious effects: Total soluble salts, 0.6896 and 0.0912; chlorids, 0.1160 and 0.035; carbonates, 0.1017 and 0.0042; and sulphates, 0.4719 and 0.052 per cent.

In a depth of water test the ground was kept thoroughly wet from April 1 to May 10. Water was then kept 1 in. deep from May 11 to May 24, and varied in depth from 1 to 6 in. on different areas from May 25 to August 27. From the data reported the author concludes that "the indications are quite strong that the maximum quantity of water on the adobe soil should not exceed 4 in. in depth and that not less than 2 in. should be used."

Analyses made by B. A. Madson showed the composition of composite samples of California-grown rice of the Japanese and Honduras types to be, respectively, water 9.62 and 9.72, protein 10.06 and 11.4, fat 2.57 and 2.51, ash 1.9 and 1.61, crude fiber 1.24 and 1.17, and carbohydrates 84.23 and 83.31 per cent. It is concluded that the food value of the California-grown sample is as high as that of the southern-grown product.

Other tables state the amount of plant food removed by wheat and rice, the labor cost of growing rice in various counties, and the duty of centrifugal pumps for lifting irrigating water less than 35 ft.

In a variety test at Biggs in 1909 an average yield of 3,486 lbs. per acre was secured from plats varying in size from one-fortieth to one-tenth of an acre. In 1910 an average yield of 7,089 lbs. per acre was secured from small plantings, while an average yield of 3,820 lbs. per acre was secured from another series of plats ranging from 0.25 to 13.51 acres in size.

"From all data obtainable it appears that California may ultimately be producing large quantities of this valuable food product." The authors regard the outlook for the industry as exceedingly encouraging, but state that this publication "distinctly does not wish to urge engaging in the industry in a large way until more is learned concerning it."

Soy beans as a supplementary silage crop, E. R. MINNS (*New York Cornell Sta. Bul. 310, pp. 259–274, figs. 6*).—Directions for growing soy beans in New York are followed by reports of the results of tests, mainly conducted by farmers, some of whom cooperated with the experiment station in their test.

On a farm at Milbrook, N. Y., 4 acres of a planting of 4 kernels of corn and 6 soy beans per hill planted by hand in hills 36 by 40 in. apart yielded in 1905 72 tons of fodder. The ratio of corn fodder to soy-bean fodder, by weight, in the mixture was estimated at 5:1. The next year a mixture of 4 or 5 grains of corn to 10 or 12 soy beans per hill gave a crop in which the ratio was slightly less. During the following March the silage contained 4.22 per cent of protein and 2.2 per cent crude fat. During 1907 corn made a poor growth and the proportion of corn to soy-bean fodder based on the weight of 12 hills was 2:1. The silage showed higher percentages of solids, protein, fat, and carbohydrates than did ordinary corn silage, and its nutritive ratio was 1:6.75.

During the next 2 years hand planting was supplanted by mixing the beans and corn in equal quantities, and sowing with a grain drill at the rate of 20 qts. of the mixture per acre in rows 3½ ft. apart. Although droughts interfered in 1911, 12½ tons of fodder per acre were secured from a field below the average in productiveness. In the same neighborhood another farmer planted 16 acres in 15 hours with a corn planter which dropped from 4 to 6 kernels of corn and from 8 to 10 beans in the same hill from separate boxes and also distributed fertilizer. A yield of from 12 to 15 tons per acre followed this planting.

In another case every third row was devoted entirely to beans and the binder was driven across the rows containing only beans. Of the mixture, 19 per cent was soy beans as compared with 11½ per cent from the rows which had been planted at the rate of 5 or 6 kernels of corn and from 8 to 12 beans per hill.

A few farmers reported the hand planting of soy beans between corn hills or very close to them "crosswise of the first cultivation." Frequently the beans failed because of dry weather, or the advancement of the corn, and the plan succeeded only under favorable conditions. Cooperative tests of mixed plantings in 3 localities in 1908, 5 in 1909, and 4 in 1910 are reported showing an apparent decrease in the growth of corn due to the mixture, but no conclusions are drawn. In 3 years' tests of mixed planting at the University farm, corn alone gave a slightly higher total yield per acre, but analyses showed a lower percentage of protein and ether extract than did the mixed fodder.

Although the author states that he "has failed to prove the real value of soy beans grown in corn fields for silage in the experiments just described," he presents statements from a number of farmers, some of whom have practiced such mixed planting and appear to regard it as decidedly advantageous.

Report on field trials with varieties of swedes in the year 1910, E. Harrison and E. E. Stokes (*Midland Agr. and Dairy Col. Bul. 6, 1910–11, pp. 35–41*).—This is a report of a variety test of swedes conducted during 1910, including data as to the yield and dry matter percentages of the varieties tested in 5 different localities. In amount of dry matter produced per acre, Golden Melon stood first, Magnum Bonum second, and Extra Improved Purple Top third.

The adulteration and misbranding of the seeds of red clover, Kentucky blue grass, orchard grass, and hairy vetch, B. T. Galloway (*U. S. Dept. Agr., Office Secretary Circ. 39, pp. 7*).—In continuation of the seed inspection of 1910 (E. S. R., 25, p. 237), 1,548 samples of seed were examined in 1911, of which 250 were found to be adulterated or misbranded.

Of 305 samples obtained as orchard grass, 28 were adulterated with the seed of meadow fescue, rye grass, or other seeds. Of 430 samples obtained as Kentucky blue grass, 35 were wholly or in part the seed of Canada blue grass or other grasses. None of the 510 samples of red clover seed secured were found to be adulterated or misbranded. Of 303 samples secured as hairy or sand vetch, 187 were found to be adulterated or misbranded, 5 were spring vetch

and contained no hairy vetch seed, while others contained varying amounts of spring and other vetches. Most of the hairy vetch seed used in the United States is imported, but an examination of the seed-producing region of Germany and the Baltic Provinces of Russia does not indicate that hairy vetch is harvested with the seed of the cultivated forms of spring vetch.

Seed tests made at the station during 1911, G. T. FRENCH (*New York State Sta. Bul. 345, pp. 42–58*).—A continuation of the tests made at this station during 1910 (E. S. R., 24, p. 736), including 548 alfalfa, 253 red clover, 98 timothy, 86 alsike, and 30 miscellaneous seed samples.

Dodder occurred in 12.9 per cent of the alfalfa samples, and in 4.74 per cent of the red clover samples. Large seeded dodder occurred in twice as many samples as did small seeded dodder. Noxious weed seed was a little more frequent in occurrence in red and alsike clover than in 1910. Observations indicated that several cases of alsike adulteration with yellow trefoil resulted from the presence of trefoil in the field. *Centaurea repens* was again found in several alfalfa seed samples, indicating the importation of seed. Russian thistle and roquette continued to attract attention in alfalfa fields but without indication of being dangerous.

Chemical tests of 4 samples of sulphur-bleached oats indicated the presence of sulphuric acid in large quantities, while germination tests showed none viable in 2 cases, 14 per cent in 1 case and 1 per cent in another.

Quality of farm seeds in 1911, F. H. HALL (*New York State Sta. Bul. 345, popular ed., pp. 4*).—This is a popular edition of the above.

Methods of keeping crop records at the Michigan Station, F. A. SPRAGG (*Michigan Sta. Rpt. 1911, pp. 193–211, figs. 15*).—This is a paper presented at the November, 1910, meeting of the American Society of Agronomy. It presents blank pages from an accession number book, oat and alfalfa breeding registers, and individual alfalfa and clover registers. The keeping of records and the use of stakes, labels, platting systems, and progeny numbers are explained.

HORTICULTURE.

Report of the horticulturist, J. E. HIGGINS (*Hawaii Sta. Rpt. 1911, pp. 25–42, pls. 5*).—Studies of various phases of avocado production were continued during the year. The results have been reported quite fully in a recent bulletin of the station (E. S. R., 26, p. 441).

The papaya investigations were continued, the work including breeding, pruning, thinning, and shipping experiments. It has been found possible to propagate papayas by using monœcious trees without the help of sterile male trees (E. S. R., 25, p. 337). A number of successful crosses are here discussed. Perfect monœcious flowers have been successfully self-fertilized and pollen from such flowers was successfully used on pistillate diœcious flowers and on perfect or hermaphrodite flowers occurring on staminate diœcious trees. The latter flowers can also be fertilized by their own pollen and by the pollen from staminate flowers on similar trees. The pollen of staminate monœcious flowers applied to pistillate diœcious flowers has thus far proved unsuccessful. The breeding work will be continued to perpetuate, if possible, the monœcious character of certain members of the first generation seedlings and at the same time combine with this character desirable characters of the diœcious papaya.

One papaya tree growing on the station grounds was devoid of seeds in all the fruits examined. Some of the flowers were hand pollinated with pollen from staminate flowers of the diœcious type, others were sealed in paraffin sacks several days before opening to prevent pollination by natural means. All of the flowers developed full grown papayas. Similar results were secured

with protected flowers on some other trees, the resulting fruit in addition to being seedless was somewhat smaller than the fruits from fertilized ovaries. These results as a whole lead to the conclusion that pollination is not always necessary for the production of fruit in the papaya and that seedlessness in case of the first noted tree, at least, is probably not due to a lack of pollination.

Pruning experiments with the papaya indicate that larger sized fruit is secured by removing the branches and encouraging fruit production along the main trunk. Thinning the fruit on certain trees which tend to overbear was likewise of considerable value. Recent trial shipments of papayas to San Francisco indicate that, with proper attention to selection of varieties possessing shipping qualities and to careful handling and packing, papayas may be successfully marketed in the United States as soon as a demand is created for the fruit.

Considerable trouble has been experienced with the Bluefields banana in Hawaii because the pseudostems break off and let the bunches fall. This appears to be due to a number of contributory causes, such as close planting and lack of pruning, thereby promoting weak stem growth. Furthermore, the bunches are allowed to remain on the plants until they become too heavy. In order to lessen decay in transit, bananas grown for export should be removed from the plant some time before the bunch has attained its full growth. The so-called Hamakua banana regarded by some as identical with Bluefields was determined as distinct from Bluefields but resembling it sufficiently to be marketed as Bluefields.

With the exception of spraying experiments (E. S. R., 26, p. 441) little new work has been undertaken with mangoes. One of the new varieties to come into bearing, the Brindabani, appears to be valuable for its heavy and early bearing habits. It has borne mature fruit 18 months after being grafted. The Brindabani and the Oahu, a large fine mango bearing fruit of good quality, are described. The method of making fruit models used at the station as a means of record in the study of mango varieties is here described in detail.

The citrus orchards have been extended somewhat during the year. A list is given of the citrus varieties now growing on the station grounds, together with information relative to accessions and distributions and a note on propagating hibiscus.

Report of the South Haven substation, F. W. Wilken (*Michigan Sta. Rpt. 1911, pp. 184–186*).—A brief report for the year ended June 30, 1911.

Variety tests of strawberries have been discontinued because the soil on the station property is not considered desirable for strawberry culture. Extensive tests of the comparative value of Bordeaux mixture, self-boiled lime-sulphur, and commercial diluted lime-sulphur on apple, peach, pear, plum, and cherry trees were started in the spring of 1911. In order to make extensive tests of lime-sulphur as a summer spray, the usual Bordeaux mixture was replaced in the general spraying by a concentrated commercial preparation, used at the rate of 1 gal. to 49 gal. of water to which was added 2 lbs. of arsenate of lead. This mixture as used on some 400 varieties of tree and small fruits, but not including strawberries, was satisfactory.

Scab on the Flemish Beauty pear and rot on the Victoria plum, which has not been successfully checked by Bordeaux mixture in previous years, were almost entirely controlled by lime-sulphur. Grape black rot was not well controlled by lime-sulphur nor was the foliage helped. Lime-sulphur at the rate of 1 gal. to 74 gal. of water was satisfactory in preventing plum rot. It can be used nearer to the picking time than Bordeaux since the stain does not show on the fruit.

A list is given of new or little known varieties of apples which produced good crops. Of these Winter Banana and Fameuse Sucre have proved of special merit.

The horticultural industries in Germany (*Gartenflora, 60 (1911), Nos. 19, pp. 409–426; 22, pp. 491–499; 24, pp. 522–527*).—A statistical review of the private, communal, and commercial horticultural industries in the various provinces of Germany.

List of secretaries of state and other horticultural societies (*Rpt. Va. State Hort. Soc., 16 (1911), pp. 326, 327*).—This list, which includes the secretaries of state and other horticultural societies in the United States and Canada, has been compiled under the direction of the Minnesota State Horticultural Society and corrected to the end of 1911.

The profitable culture of vegetables, T. Smith (*London, New York, Calcutta, 1911, pp. XV+452, figs. 172*).—A handbook for the market gardener and others dealing with both ordinary and French gardening methods.

List of publications important to fruit growers, J. P. Stewart (*Penn. Dept. Agr. Bul. 215, 1911, pp. 33*).—This list is prepared primarily to meet the needs of those actively engaged in fruit growing. It is based largely upon recent publications of various agricultural experiment stations and of the U. S. Department of Agriculture and also includes important books, periodicals, reports of horticultural organizations, etc.

The arrangement is both by topics relating to various phases of orcharding and by specific kinds of fruits.

[Orchard cover crops], H. J. Eustace (*Michigan Sta. Rpt. 1911, pp. 181, 182*).—In some cover crop and fertilizer tests being conducted by the Michigan Station in a number of vineyards and orchards, winter vetch sown about August at the rate of from 25 to 30 lbs. per acre has thus far proved the most satisfactory.

Profitable crops for the young orchard, H. L. Price (*Rpt. Va. State Hort. Soc., 16 (1911), pp. 181–195*).—A discussion of orchard cropping practices in Virginia, including a summary of data secured relative to this subject.

Methods and implements in orchard cultivation, H. A. Surface (*Rpt. Va. State Hort. Soc., 16 (1911), pp. 33–53, pl. 1*).—A paper on this subject with the discussion following.

Spraying practice for orchard and garden, S. A. Beach (*Iowa Sta. Bul. 127, pp. 49–86, figs. 9*).—This bulletin describes methods of combating the more common insect pests and plant diseases which infest Iowa orchards and gardens, special attention being given to the apple. The directions have been prepared to conform with the present knowledge of spraying, being based both on the work of scientific investigators and the experience of practical fruit growers.

The present status of varieties in commercial orchards, A. W. Drinkard, Jr. (*Rpt. Va. State Hort. Soc., 16 (1911), pp. 110–120, pls. 2*).—This article summarizes the data relative to varieties secured by the author in connection with an orchard survey of Virginia, a full report of which is to appear later.

Tabular data are given showing the relative rank of varieties in commercial orchards, and comparing the leading varieties in bearing orchards, young orchards, and prospective orchards. York holds first rank in all classes of orchards, both as regards the number of orchards in which it is found and also the number of trees planted. Winesap holds second place in the bearing orchards, and third place in the young orchards and in the prospective orchards. Although Ben Davis is third in the bearing orchards, it is only eighth in the young orchards and ninth in the prospective orchards. The other leading varieties are Albemarle, Stayman Winesap, Mammoth Black Twig, Grimes, Rome, and Black Ben Davis.

On vegetable forcing with special reference to the etherization of strawberries, G. BULTEL (*Jour. Soc. Nat. Hort. France, 4. scr., 13 (1912), Apr., pp. 212–217*).—In support of his previous investigations (E. S. R., 19, p. 144), the author found in tests conducted in 1911 that strawberry plants submitted to ether vapor came into bearing about 2 weeks earlier than untreated plants.

Grape stocks best suited for dry and limy soils, N. GARCÍA DE LOS SALMONES (*Prog. Agr. y Pecuario, 17 (1911), Nos. 726, pp. 330–332; 727, pp. 346–348; 728, pp. 361–364; 729, pp. 379, 380; 730, p. 396; 731, pp. 410–412*).—A paper on this subject prepared with special reference to Spanish conditions and based upon various papers read before the International Congress of Agriculture.

Hot room callusing, F. T. BIOLETTI and L. BONNET (*California Sta. Circ. 76, pp. 12, figs. 6*).—In a previous bulletin of the station a method of callusing grape cuttings in beds of sand was described (E. S. R., 18, p. 549). The sand callusing bed, however, has been found to have many defects and inconveniences, most of which can be overcome by stratifying the cuttings in boxes of moss and callusing in a hot room. The hot room method, which has been adopted in California by all of the large producers of grafted vines, is here discussed in detail under the following headings: Methods of grafting, graft trays, callusing boxes, callusing materials, filling the boxes, the hot room, temperature, moisture, aeration, removal from the hot room, hardening, and planting.

Investigations on the practice of heading-in grapes, L. RAVAZ (*Ann. École Nat. Agr. Montpellier, n. ser., 11 (1912), No. 4, pp. 285–323, figs. 7*).—The author reviews the literature of the subject and gives an account of his investigations conducted for a number of years at the Montpellier Agricultural School.

Summarizing the results it appears that the practice of heading-in, if employed shortly after the flowering season, tends to increase production, but at the expense of quality.

Grape culture in Pennsylvania, W. H. SILL (*Penn. Dept. Agr. Bul. 217, 1912, pp. 66, pls. 51*).—A practical treatise, superseding Bulletin 128 of the same series (E. S. R., 16, p. 976), on commercial grape growing, discussing the extent and history of the grape industry, and the location, details of production, and business management of a vineyard.

Contribution to the study of olive varieties, J. RUBY (*Bul. Soc. Nat. Agr. France, 72 (1912), No. 3, pp. 299–316*).—A classification of the related varieties of olives growing in France, based upon the shape of the fruit. The important characteristics of each variety are indicated, together with its common name, cultural region, and composition of pulp.

Protecting the California orange crop from frost, A. G. MCADIE (*Mo. Weather Rev., 39 (1911), No. 12, pp. 1910–1912*).—The author reviews the conditions prevailing in California during the frost period of December, 1911, compares the results with those of previous years, and cites examples in which citrus orchards were successfully protected from frost damage by the use of smudges and orchard heaters.

Keeping quality of citrus fruit treated to eliminate frosted fruit, C. W. MANN (*Cal. Cult., 38 (1912), No. 19, pp. 582, 599, 607*).—A review of the results secured in a number of California packing houses in the use of distillate or kerosene oil and of alcohol in separating frosted citrus fruit from sound fruit.

The alcohol method has proved the most satisfactory, the fruit being uninjured by the treatment, except where the skin has been previously punctured or broken. The use of distillate in the treatment of oranges generally shows a bad effect on the flavor of the fruit and results in an increased percentage of rot.

Alcohol for separation of frosted fruit, D. C. LEFFERTS (*Cal. Cult., 38 (1912), No. 19, pp. 583, 584*).—The author reports progress during the past

season in the use of an alcohol bath for the separation of frosted oranges from sound fruit (E. S. R., 22, p. 737). The results to date indicate that in certain cases the specific gravity of good fruit may be sufficiently variable as to cause difficulty in the use of the bath.

Fruit drying, W. J. ALLEN (*Dept. Agr. N. S. Wales, Farmers' Bul. 52, 1911, pp. 22, figs. 17*).—A popular treatise on methods of drying apricots, peaches, nectarines, prunes, figs, apples, pears, and raisin and currant grapes, including a description of the necessary equipment.

Morphologic-physiologic investigations of the flowers of coffee species, F. C. VON FABER (*Ann. Jard. Bot. Buitenzorg, 2. ser., 10 (1912), pt. 1, pp. 59–160, pls. 12*).—This is a contribution to the knowledge of the physiology of the coffee plant, based partly on material secured from the author's experimental garden and partly on material from the Buitenzorg Botanical Garden. The subject matter is presented under the following general headings: Development processes, morphology and cytology of the coffee flower; fructification; processes subsequent to fructification; abnormalities in development; experimental investigations on the pollination and fructification of coffee species; physiological investigations of pollen grains; a partial sterility of coffees; the occurrence of small constant sterile flowers in various coffee species; general considerations on sterility; the cause of sterility in coffee; and experimental tests on the influence of exterior factors on the formation of sexual organs in *Coffea liberica*, *C. arabica*, and Kalimas hybrid, a supposed hybrid of these species.

Coffee culture, O. TELLEZ (*Bol. Dir. Gen. Agr. [Mexico], Rev. Agr., 1 (1911), Nos. 4, pp. 287–308, pls. 2; 5, pp. 391–407, pls. 4; 6, pp. 502–519, pls. 4*).—A popular treatise on the establishment, culture, and management of a coffee plantation.

Fertilizer experiments with coffee, G. HELMRICH (*Bol. Dir. Gen. Agr. [Mexico], Rev. Agr., 1 (1911), Nos. 1, pp. 7–26, pls. 2; 2, pp. 104–120, pls. 8*).—The results of several years experiments in the use of artificial fertilizers on some coffee plantations in Mexico are reported.

The coco palm and its culture, P. PREUSS (*Die Kokospalme und ihre Kultur. Berlin, [1911], pp. VII+221, pls. 17, figs. 21; rev. in Naturw. Rundschau, 27 (1912), No. 16, pp. 206, 207*).—This is a practical treatise on the botany, uses, culture, insect pests, and diseases of the coconut palm (*Cocos nucifera*), including also information relative to preparation and marketing of the products and statistics of production and commerce.

A bibliography is appended.

Roses, H. R. DARLINGTON (*London and Edinburgh, [1911], pp. XII+193, pls. 8*).—In addition to cultural details, selections and descriptions are given of various kinds of exhibition, garden, and climbing roses, together with a calendar of operations for each month of the year.

A bibliography on roses is appended.

Planning and adorning the farmstead (*Iowa Sta. Bul. 126, pp. 23–41, figs. 15*).—This bulletin comprises 2 articles which relate to the planning and development of the farmstead, both from the standpoint of convenience and of securing an attractive landscape effect.

Planning and adorning the farmstead, A. T. Erwin (pp. 23–37).—Suggestions are given for the location of buildings, drives, walks, trees, shrubbery, lawn making, etc. A selected list of trees, shrubs, vines, etc., is given.

Planning the farm in relation to the farmstead, J. B. Davidson (pp. 38–41).—The author here presents a number of principles which should be considered in planning the farm for convenience, together with plans showing a good arrangement and a poor arrangement of farm buildings.

FORESTRY.

A classification for forestry literature (*Yale Forest School Bul. 1, 1912, pp. 6*).—This classification has been prepared by the faculty of the Yale Forest School to supply the demand for a simple and comprehensive classification adapted to any library system. The general divisions are as follows: General works, forest botany, silviculture, forest protection, lumbering, forest management, forest technology, history and statistics, forest influences, and forest policy.

Annual progress report of forest administration in the Western and Eastern Circles of the United Provinces for the forest year, 1910–11, B. B. Osmaston and J. S. Campbell (*Ann. Rpt. Forest Admin. West. and East. Circles [India], 1910–11, pp. 18+8+18+XCIX+2*).—This is the usual report relative to the constitution, management, and exploitation of the state forests in the Western and Eastern Circles of the United Provinces, including also a report of the district protected forests in the Kumaun division. The important data relative to alterations in areas, forest surveys, forest protection, silvicultural operations, yields, revenues, etc., are appended in tabular form.

Annual administration report of the forest department of the Madras Presidency for the twelve months ending June 30, 1911, P. M. Lushington, H. B. Bryant, and J. S. Battie (*Ann. Admin. Rpt. Forest Dept. Madras, 1911, pp. 66+CX+16*).—This is the usual report relative to the constitution, management, exploitation, and administration of the state forests in the Northern, Central, and Southern Circles of the Madras Presidency, including financial statements for the year. The important data relative to areas, working operations, yields, revenues, etc., are appended in tabular form.

The important timber trees of the United States, S. B. Elliott (*Boston and New York, 1912, pp. 382, pls. 32*).—This work, which is based in part on the author's personal observations and in part on the literature of the subject, is offered as a manual of practical forestry for the use of foresters, students and laymen in forestry, lumbermen, farmers and other landowners, and all who contemplate growing trees for economic purposes.

Silviculture, C. Werckle (*Bol. Fomento [Costa Rica], 1 (1911), No. 12, pp. 948–953, figs. 2*).—Descriptive notes are given of the important timber and rubber trees of Costa Rica.

Forest catalogue of Mexico (*Catalogo Forestal de la Republica Mexicana. Mexico: Govt., 1912, pp. 29*).—This comprises a catalogue of the more important trees and shrubs forming the woods in the tropical, temperate, and cold regions of Mexico. The data given include the habitat, common and scientific names, and industrial uses. Partial information is also given on a large number of unidentified trees.

The hardy catalpa (Catalpa speciosa) (*Kansas Sta. Circ. 20, pp. 19, pls. 8, fig. 1*).—A popular treatise on catalpa culture, discussing methods of identifying the hardy catalpa (*C. speciosa*), methods of propagation, planting stock, selection of site, planting operations, cultivation and care, protection against rabbits, cutting back, form and size, fungus disease, length of rotation for the catalpa, second crop, cutting, seasoning, durability and character of catalpa wood, range of successful growth, and catalpa growing as a commercial enterprise.

On the histology of woods of Biota orientalis and Thuja occidentalis, F. Hollendonner (*Bot. Közlem. [Budapest], 11 (1912), No. 2, pp. 45–57, figs. 7*).—A detailed study of the wood structure in the above named species.

A note on some germination tests with sal (Shorea robusta) seed, R. S. Troup ([*Indian*] *Forest Bul. 8, 1912, pp. 13*).—The tests here reported in detail were made to ascertain to what extent the fertility of sal seed is affected by

the size and condition of the trees producing it and by the locality and the type and density of the forest in which the trees grow.

Of the factors observed the time of collection was the only one which appeared to have an influence on the fertility of the seed. The most fertile seed were obtained at the middle of the seeding period.

Influence of the origin and germinative power of pine seed upon the progeny, G. Schröder (*Deut. Landw. Presse, 39 (1912), Nos. 36, pp. 421–423, fig. 1; 37, pp. 437, 438*).—A popular summary of European investigations.

Monograph on the rubber industry in Bolivia, M. V. Ballivián and C. F. Pinilla (*Monografía de la Industria de la Goma Elastica en Bolivia. Bolivia: Govt., 1912, pp. V+354+LXXXIV+III, pls. 9*).—This monograph contains general considerations relative to the geography, climatology, and resources of Bolivia and discusses in detail the rubber industry of the country relative to its history, botany, methods of exploitation, and marketing. A statistical account is given of the industry in the various producing regions of Bolivia and the laws relating to the industry are appended.

Growing a woodlot from seed, J. A. Ferguson (*Missouri Sta. Circ. 52, pp. 139–146, figs. 2*).—Popular instructions are given for starting a forest nursery and the establishment of a woodlot on the farm, including tabular data regarding the collecting, storing, and planting of tree seeds.

Results of sand and ravine binding work in Russia (*Izheg. Lies. Dept., 1 (1909), pp. 423–494*).—An account is given of sand and ravine binding work conducted in the Voronezh, Kharkov, Poltava, Saratov, and Samara provinces of Russia. Little attention has been paid to the restoration of ravines thus far. The fixation of sand dunes has been done largely with sand willows and pines.

Note on the antiseptic treatment of timber in India, with special reference to railway sleepers, R. S. Pearson (*Indian Forest Rec., 3 (1912), No. 2, pp. 107, pls. 9, fig. 1*).—This note briefly reviews past experiments made in India with special reference to the preservation of railway ties, reports the results of the experiments made at the Imperial Forest Research Institute during the past 2 years with a variety of antiseptic solutions, and gives a résumé of the work which it is proposed to carry out in the future.

On wood preservation with fluorids, R. Nowotny (*Österr. Chem. Ztg., 15 (1912), No. 8, pp. 100–102*).—The author describes some experiments recently started in Austria in the use of bellit, a new fluorid combination, for the preservation of wooden poles, and gives a progress report on the comparative tests of zinc fluorid, copper sulphate, and creosote for preserving poles (E. S. R., 20, p. 544). The tests were started in 1905 and 1906.

An inspection of the poles in 1911 indicated that creosote was by far the most efficient preservative and that zinc fluorid was much more efficient than copper sulphate. The cost of creosoted poles, however, was considerably higher than those treated with zinc fluorid.

The experiments are to be continued.

How to prolong the life of fence posts, J. A. Ferguson (*Missouri Sta. Circ. 51, pp. 135–138, fig. 1*).—A popular circular discussing various methods of prolonging the life of fence posts, in which special consideration is given to the use of creosote by the open tank method (E. S. R., 19, p. 150). A simple form of open tank is described.

DISEASES OF PLANTS.

Diseases and injuries to cultivated plants in 1909 (*Ber. Landw. Reichsamte Innern, 1911, No. 25, pp. VIII+270*).—A summary is given of literature relating to plant diseases and insect pests and their control.

Fungi, an attempt at their classification, P. VUILLEMIN (*Les Champignons, Essai de Classification. Paris, 1912, pp. VII+425*).—This is one of a series of 12 volumes treating of fungi. It contains a historical review of different systems of classification, after which the author treats of the grouping of fungi according to their cytological and biological characters.

Some new parasitic fungi of Japan, M. SHIRAI and K. HARA (*Bot. Mag. [Tokyo], 25 (1911), No. 290, pp. 69–73, pl. 1; abs. in Bul. Trimest. Soc. Mycol. France, 27 (1911), No. 3, p. 397*).—The authors report, with illustrations and descriptions, the following new species of Japanese fungi: *Lophodermium chamæcyparisii, Asterula chamæcyparisii, Phæosphærella japonica, Leptosphæria cinnamomi, Mycosphærella paulowniæ, M. zingiberi, M. macleyæ,* and *Sphærulina aucubæ.*

Notes on the Japanese species of Phragmidium, M. KASAI (*Trans. Sapporo Nat. Hist. Soc., 3 (1909–10), pp. 27–51, pl. 1*).—The author describes 17 species of Phragmidium occurring in Japan, 11 of which are peculiar to that country and 3 are new to science. The species occur parasitically on Potentilla, Rubus, Rosa, and Sanguisorba.

Cardinal temperatures for the germination of uredospores of cereal rusts, E. C. JOHNSON (*Abs. in Phytopathology, 2 (1912), No. 1, pp. 47, 48*).—The author has made a study of the effect of temperature on the germination of the spores of cereal rusts, believing that it would throw further light on the relation of meteorological conditions to rust development. The investigations were carried on with the uredospores of *Puccinia graminis* on wheat, barley, and oats, *P. rubigo-vera* on wheat and rye, and *P. coronata* on oats. The spores were obtained from fresh material, and the germinations were made in distilled water in incubators in which the temperature ranged from 1.5 to 31° C.

In the experiments the maximum and minimum temperatures for the different rusts were as follows: *P. graminis*, from 2 to 31°; *P. rubigo-vera* on wheat and rye, about the same; *P. coronata* on oats, a higher minimum, 7 to 8°, with a maximum of 30°.

The optimum temperature could not be definitely determined by percentages, on account of the lack of uniformity between 9 and 25°. From the development of the germination tube, the optimum temperature appeared to be between 12 and 17° for all the forms studied.

These low cardinal temperatures are believed to explain such points as the difficulty with which infection takes place in excessively warm greenhouses and on hot days; the difficulty of finding viable uredospores in early spring, the majority already having germinated; and the favoring of rust development and epidemics by subnormal temperatures at the critical infection periods of the host plants.

A new method of combating smut of cereals, G. D'IPPOLITO (*Bol. Quind. Soc. Agr. Ital., 16 (1911), No. 19, pp. 680–685; abs. in Riv. Patol. Veg., 5 (1911), No. 9, pp. 133*).—The main features of this method are (1) steeping the grain in water at from 20 to 22° C. for 4 hours to start the growth of the internal mycelium and (2) placing it in water at 52° for 10 minutes to kill the growing fungus.

Ergot on oats, C. W. WARBURTON (*Bot. Gaz., 51 (1911), No. 1, p. 64, fig. 1; abs. in Centbl. Bakt. [etc.], 2. Abt., 32 (1912), No. 6–12, pp. 300, 301*).—The author reports the discovery at Ames, Iowa, of ergot (*Claviceps purpurea*) on oats, a disease said to be new in the United States. The attack was noted on a variety immune to smut in July, 1909, a wet season favorable to ergot epidemics. It did not reappear in the dry season of 1910.

Leaf spot of oats, H. NILSSON-EHLE (*Sveriges Utsädesför. Tidskr., 21 (1911), No. 1, pp. 54–56, pl. 1; abs. in Bot. Centbl., 116 (1911), No. 23, pp. 603,*

604).—The author, in resumption of previous work on Scolecotrichum (E. S. R., 23, p. 46), mentions the fact that this disease, known in Sweden for about 20 years and associated with too strong a liming of the soil, is best controlled by the application of ammonium sulphate, a remedy already in successful use by cultivators in more southern lands.

A Sclerotium disease of blue joint and other grasses, A. B. STOUT (*Wisconsin Sta. Research Bul. 18, pp. 207–261, pls. 8*).—A study is reported of a disease of blue joint and other grasses, which was begun by the author in the summer of 1907.

The disease is due to the fungus *S. rhizodes*, which attacks the leaves of various grasses, causing them to become dried, rigid, and bent into characteristic shapes. Upon the leaves felts of mycelium are produced from which sclerotia are developed. The development of the fungus on the leaves is most vigorous during April and May, when the death of the entire culm may result.

The fungus has been found on 11 species of grasses about Madison, Wis., being especially destructive to *Calamagrostis canadensis*, which serves as its principal host. It is vigorously parasitic on the leaves, less so in the buds and stems, and but slightly so on the roots, where it assumes some of the characteristics usually associated with mycorrhiza.

The fungus is said to be of considerable economic importance, having destroyed or dwarfed as much as 45 per cent of the plants of *C. canadensis* in a meadow near Madison, Wis., in the season of 1911. It seems to be quite generally distributed throughout Wisconsin, but has not been reported elsewhere in America.

Further data are desired on additional host plants, geographic range of the fungus, economic importance, germination of the sclerotia, and infection of the seedlings.

A bibliography of the subject is included.

Potato crop and seed, O. APPEL (*Illus. Landw. Ztg., 31 (1911), No. 15, pp. 134–136; abs. in Centbl. Bakt.* [*etc.*], *2. Abt., 31 (1911), No. 11–15, pp. 396, 397*).—In continuance of previous work (E. S. R., 21, p. 243; 22, p. 347; 23, p. 148) the author discusses the various potato diseases of Germany in connection with the problem of their prevention as related to seed tubers and their treatment. The recommendations made include (1) sufficient drying on harvesting to check multiplication of bacteria and permit formation of wound cork, and (2) the selection of good sized tubers from healthy and well bearing plants.

Blackleg of potato, W. BEHRENS and G. MARPMANN (*Ztschr. Angew. Mikros., 16 (1911), No. 4, pp. 91–99; abs. in Centbl. Bakt.* [*etc.*], *2. Abt., 32 (1912), No. 6–12, pp. 326, 327; Bot. Centbl., 119 (1912), No. 8, p. 192*).—The authors report that an examination of plants injured by insects and affected by this disease showed no bacteria directly, but it is claimed that culture methods gave 7 characteristic species of which 2 appeared able to produce the disease. These are described. It is suggested that inoculation on a larger scale, and under more nearly natural conditions than those employed, might lead to more positive results.

Inheritance of leaf-roll disease, A. SCHMID (*Illus. Landw. Ztg., 31 (1911), No. 17, p. 160; abs. in Centbl. Bakt.* [*etc.*], *2. Abt., 31 (1911), No. 11–15, pp. 331, 332*).—The recent invasion of parts of Switzerland by this disease and resulting decrease of crops led to an experimental study of the possible hereditary effects of its attacks. Nineteen sound and 19 diseased tubers of like sort and size from the same field were planted and the resulting vegetation and crops compared. It was found that the plants from the diseased tubers were backward and showed the characteristic leaf-roll form, while the crop was

only about 21 per cent of that from the sound tubers. The weather was abnormally damp during the experiment.

The factors governing germination and infection with Phytophthora infestans, I. E. MELHUS (*Abs. in Phytopathology, 2 (1912), No. 1, p. 46*).—In experiments involving about 300 tests at temperatures ranging from 8 to 14° C., 96 per cent of the spores germinated, while at 21 to 25° only 20 per cent germinated, indicating that comparatively low temperatures favor germination with *P. infestans* as well as with Cystopus (E. S. R., 26, p. 342). The optimum temperature for oospore germination was found to lie between 10 and 13°, the minimum between 1 and 2°, and the maximum between 21 and 24°. Field observations showed oospore germination to occur freely on potato plants at temperatures between 8 and 15°.

Inoculation experiments showed that temperatures of 10 to 13° produced higher percentages of infection than 21 to 25°, and that the upper surface of the potato leaf is less easily infected than the lower.

The effect of Bordeaux mixture and various polysulphids on the germination of *P. infestans* and *Plasmopara viticola* was investigated. Varying the amount of lime in Bordeaux mixture did not affect the toxicity. None of the constituents of the polysulphids was found toxic at the proportion occurring in the polysulphid. The most nearly toxic agent, however, was the alkaline constituent.

Hypertrophy-structure in potatoes, M. FUCSKÓ (*Bot. Közlem. [Budapest], 11 (1912), No. 1, pp. 14–29 (3)–(11), figs. 10*).—This is a study of the structure of the abnormal developments resulting from an oversupply of water in contact with tubers. These are figured and described. One result is the formation of abundant starch in the sublenticular cells. This, however, seems to be transitory. A regular periodicity is said to be apparent in the formation of these excrescences.

Relative merits of lime sulphur, lead benzoate, and Bordeaux mixture for spraying potatoes, F. C. STEWART and G. T. FRENCH (*Abs. in Phytopathology, 2 (1912), No. 1, pp. 45, 46*).—In 1911 the authors made a comparative test of lime-sulphur, lead benzoate, and Bordeaux mixture for spraying potatoes, the mixtures being thoroughly applied 6 times at intervals of 2 weeks. Tip burn was the only important disease involved. Bordeaux mixture checked this, prolonged the life of the plants, and increased the yield at the rate of 100.3 bu. per acre; lead benzoate was found to neither benefit nor injure the plants; while those sprayed with lime-sulphur were smaller than the checks, as much affected by tip burn, and yielded 39.5 bu. less per acre than the checks.

The conclusion reached is that neither lime-sulphur nor lead benzoate can be profitably substituted for Bordeaux mixture in spraying potatoes. Both lack the stimulating influence possessed by Bordeaux mixture, while lime-sulphur tends to dwarf the plants and lower the yield.

Nematode disease of the sugar beet, B. NĚMEC (*Ztschr. Pflanzenkrank., 21 (1911), No. 1–2, pp. 1–10, figs. 6; abs. in Centbl. Bakt. [etc.], 2. Abt., 32 (1912), No. 6–12, pp. 311, 312; Bot. Centbl., 116 (1911), No. 24, pp. 623, 624*).—This is a study of the anatomical changes observed in roots of the sugar beet as the result of attacks by eelworms.

Most noticeable are the so-called giant cells which develop by growth and fusion of cells in the vascular bundles, sometimes closing the channels completely. Such giant cells have thick walls and abundant cytoplasm, sometimes with several large nuclei. They are said to hinder or interrupt transportation of water and other materials along the roots attacked, and by checking root-tip growth they lead to the development of new lateral roots and the impoverish-

ment and exhaustion of the plant. This becomes yellowed, and easily wilts and dies in case of unusual heat or dryness. The losses observed in crop returns are said to be due to the impoverishment of the plant, (1) by stoppage of channels and (2) by withdrawal of material (a) for the building of the giant cells and of the lateral roots and (b) for the nourishment of the parasites. The parasites are thought to produce on entering the root a stimulation which occasions the observed abnormal cell development. The giant cells are thought to function somewhat as glands or nectaries, producing material suitable for nourishment of the nematodes.

Averting nematode injury, KRÜGER (*Bl. Zuckerrübenbau, 18 (1911), Nos. 17, pp. 294–300; 18, pp. 311–313; abs. in Ztschr. Landw. Versuchsw. Österr., 14 (1911), No. 12, p. 1479*).—This is a preliminary report on the author's study of nematodes on sugar beets continued for 4 years and not yet completed, but from which the following conclusion may, in his opinion, be justly drawn:

Nematode attack is favored by poverty of soil, by injurious constituents therein, and by attacks of other parasites. Two plans for the protection of the crop are indicated. The first, which aims to limit increase and perpetuation of the infection, consists in removing all such weeds and offal from the beets as might help to shelter and nourish the parasites. The second plan, which aims at destruction of the parasites, consists in the employment of lime, carbon bisulphid, etc., and of the Kühn method of trap-plants. It is believed that by these means the injury may be greatly reduced, if not entirely prevented.

A new method for combating the sereh disease of sugar cane, T. VALETON, Jr. (*Teysmannia, 22 (1911), No. 12, pp. 767–772*).—Attention is called to the occasional resistance of certain varieties of cane to this disease, and the probable value of breeding experiments to fix and extend these forms is discussed.

A new fruit disease of eggplant, J. HANZAWA (*Trans. Sapporo Nat. Hist. Soc., 3 (1909–10), pp. 83–87, pl. 1*).—A description is given of *Rhabdospora melongenæ* n. sp., a fungus that sometimes causes a severe rotting of the fruit of the eggplant.

Withertip of fruit and ornamental trees, E. VOGES (*Deut. Landw. Presse, 39 (1912), No. 24, pp. 285, 286, figs. 4*).—An account is given of a disease of twig ends of cherry, poplar, and other trees, resulting in their speedy death, while neighboring twigs continue to appear healthy. Investigation revealed the presence of certain fungi in the affected parts. Of these, 3, described and illustrated, are said to be *Nectria ditissima*, *Fusarium willkommi*, and *Monilia cinerea*.

Cement dust injury to fruit trees, P. J. ANDERSON (*Abs. in Phytopathology, 2 (1912), No. 1, p. 45*).—An investigation has been begun at the request of certain fruit growers to determine the effect of dust from cement mills.

The dust was found to contain a high percentage of soluble calcium salt. This dissolved in the stigmatic secretions and rendered them alkaline, and pollen would not germinate in the alkaline solution. Artificial tests of the pollen of cherries, pears, and apples gave no germination, even in very weak solutions of the dust. Further tests showed that there was no germination even when the calcium was not in an alkaline condition.

Foliage diseases of the apple, H. S. REED, J. S. COOLEY, and J. T. ROGERS (*Virginia Sta. Bul. 195, pp. 23, figs. 13*).—This bulletin is based on experiments made during the years 1910 and 1911, the diseases investigated being the frog-eye leaf spot, cedar rust, and apple scab as a foliage disease.

The frog-eye leaf spot is said to be widely distributed and is probably due to a number of fungi which produce similar appearances on the leaves. The varie-

ties Ben Davis and Black Twig seem more subject to this trouble than others, York Imperial suffering less severely and Winesap being hardly affected at all.

During the seasons of 1910 and 1911 spraying experiments for the control of these leaf diseases were carried on in a number of places in Virginia to test the value of different fungicides, the times of application, etc. The experiments showed that dilute lime-sulphur solution is as effective in controlling the leaf spot and scab as standard Bordeaux mixture. Where the scab is not abundant the first spraying should be made immediately after the falling of the flowers, followed by a second and third application at intervals of from 15 to 20 days. Where scab is abundant an additional application of the spraying material should be made just before the blossoms open. Bordeaux mixture appeared to be the only fungicide which was successfully used for combating bitter rot. For this purpose 3 applications should be given the trees, the first between June 20 and July 1, with subsequent sprayings at intervals of from 15 to 20 days. The addition of iron sulphate to lime-sulphur or Bordeaux mixture was found to increase the sticking properties of the fungicides without affecting their value in any sense. It was also found that arsenate of lead aside from being a good insecticide had some value as a fungicide.

The injury to the foliage attributed to spraying mixtures is sometimes caused by the use of too great quantity or improperly made mixtures. It was found that fruit may be burned with lime-sulphur if sprayed in very hot weather. Tender skinned apples were affected by Bordeaux mixture in a similar way if sprayed early in the season. The danger of russeting is very slight 2 months after blooming and later. Where early applications of the fungicides are necessary the authors recommend the use of lime-sulphur for the first 2 sprayings.

Experiments on the simultaneous treatment for the control of downy and powdery mildew, G. MARTELLI (*Separate from Agr. Etneo, 1911, No. 4, pp. 7*).—The results of experiments for the combined treatment of grapes to control the downy and powdery mildew are given. The vines were sprayed with Bordeaux mixture to which was added an alkaline polysulphid, Bordeaux mixture followed by applications of sulphur, and a proprietary mixture of copper and sulphur. Three applications were given to different lots of over 6,000 grapevines in the experiment, and the cheapest and most efficient fungicide was the Bordeaux mixture combined with the alkaline polysulphid.

Invasion of Europe by the American gooseberry mildew and oak mildew, G. KÖCK (*Ztschr. Pflanzenkrank., 20 (1910), No. 8, pp. 452–455; abs. in Centbl. Bakt. [etc.], 2. Abt., 31 (1911), No. 11–15, p. 345*).—This continues communications by the author on this subject (E. S. R., 22, p. 743; 23, p. 50; 24, p. 747), giving here dates and places of first appearance or early appearances of each of these mildews in this region.

The influence of Hemileia vastatrix on the culture of coffee in Java, P. S. J. CRAMER (*Rev. Agr. Nouvelle-Calédonie, 1911, Nos. 12, pp. 24–50; 13, pp. 16–24*).—An account is given of *H. vastatrix* in Java, the influence it has had on the Arabian coffee production, and means that have been undertaken for its control.

The production of coffee under government control in Java has fallen from an average of 923,333 piculs (123,111,100 lbs.) in the 5 years from 1880 to 1885 to 81,746 piculs in the 2 years from 1906 to 1908, due, it is claimed, to the disastrous invasion of the fungus. To combat the disease, spraying and the growing of resistant varieties have been resorted to. *Coffea liberica, C. robusta*, and other species, and some of their hybrids appear quite resistant, and their introduction has been successfully accomplished. Spraying with Bordeaux mixture

has been followed with good results in seed beds and nurseries, but its use in the plantation is thought to be impracticable.

The author comments on the absence of this fungus in American coffee raising countries, and attributes it to a number of factors, among them a lack of suitable climatic conditions, natural enemies of Hemileia in America, and the absence of suitable host species on which the alternate generations of the fungus may develop.

Injury to pines by smelter gases, K. FEIST (*Arch. Pharm., 249 (1911), No. 1, pp. 7–9; abs. in Centbl. Bakt.* [*etc.*], *2. Abt., 32 (1912), No. 6–12, p. 331; Bot. Centbl., 116 (1911), No. 21, p. 553*).—This is an account of the author's investigation of the changes produced in the foliage of pines injured by exposure to gases evolved in the smelting of siderite. Comparative examination of the needles of sick and of sound pines showed that the percentage of ash was considerably increased in case of the former. There was also a notable increase of sulphuric acid, which could come only from the air, while the alkalinity of the ash itself was considerably lowered.

New fungi on Japanese bamboos, J. MIYAKE and K. HARA (*Bot. Mag.* [*Tokyo*], *24 (1910), No. 286, pp. 331–341; abs. in Centbl. Bakt.* [*etc.*], *2. Abt., 31 (1911), No. 11–15, pp. 321, 322*).—The authors give the results of their studies on a number of fungi of which the following appear to be new: *Lasiosphæria culmorum*, *Guignardia bambusæ*, *Mycosphærella bambusifolia*, and *Phæosphæria bambusæ*. The article is mainly in the Japanese language.

The importance of sanitation in the control of certain plant diseases, L. R. JONES (*Abs. in Phytopathology, 2 (1912), No. 1, p. 46*).—The author states that while fungicidal sprays must continue to be the chief reliance in combating many plant diseases, more attention should be given to the fundamental sanitary measures to secure the healthy development of the host plants. Recent experiments in Wisconsin have shown this to be essentially true with certain diseases of crops introduced into new regions for trucking and canning. These include the cabbage diseases, especially club root, blackleg, and yellows, some pea diseases, the bacterial wilt of cucurbits, and crown gall of nursery plants.

The covering power of the precipitation membranes of Bordeaux mixture, B. F. LUTMAN (*Phytopathology, 2 (1912), No. 1, pp. 32–41, figs. 6*).—A study on the physical properties of the precipitate of Bordeaux mixture is reported, in which an attempt was made to measure as nearly as possible the actual area of the precipitation membrane produced by copper sulphate solution and lime water, or milk of lime. Six formulas were used, including that known as Pickering's Bordeaux mixture.

About 100 cc. of the Bordeaux mixtures was made up, 1 cc. diluted with from 200 to 400 cc. of water, and ½ cc. of this dilution placed on a cover glass and allowed to dry, after which the membranes were examined microscopically, drawn, and their relative area measured. It was found that increasing the amount of copper sulphate and lime increases the area of precipitation film produced.

The amount of precipitation membrane, as shown by precipitation in hydrometer jars, was determined. The Pickering's Bordeaux showed an apparently large amount of precipitate. This was only apparent, however, as shown by the actual measurements which were given.

In conclusion the author calls attention to the fact that bulk for bulk the same quantity of Pickering's Bordeaux mixture does not have the same covering power as even the 2½ : 2½ : 50 mixture. On the other hand, for the amount of material used it produces the greatest amount of film area.

ENTOMOLOGY.

Report of the entomologist, D. T. Fullaway (*Hawaii Sta. Rpt. 1911, pp. 17–24, figs. 4*).—This report consists principally of notes on insects attacking leguminous crops, including the pigeon pea (*Cajanus indicus*), cowpea (*Vigna catjang*), jack bean (*Canavalia ensiformis*), velvet beans (*Mucuna pruriens*), soy bean (*Glycine hispida*), peanut (*Arachis hypogæa*), sweet clover (*Melilotus officinalis*), and alfalfa (*Medicago sativa*), especial attention having been given to the enemies of the pigeon pea.

The army worm (*Heliophila unipuncta*) sometimes devastates large fields of alfalfa before it can be brought under control by its natural enemies, and extensive plantings of jack beans have been made waste by *Spodoptera mauritia*, another common army worm. The foliage of legumes is often badly eaten by certain leaf-rollers, *Omiodes monogona*, *Amorbia emigratella*, and *Archips postvittanus*, and by the looper, *Plusia chalcites*, but the damage they inflict is apparently not great except in the case of *O. monogona*, which, so far as is known, feeds exclusively on legumes. It, however, is subject in turn to the attacks of parasites which keep it fairly well in check. *Limnerium blackburni* and *Chalcis obscurata* have been bred from *O. monogona*. The plant louse which attacks legumes is thought to be *Aphis gossypii*. "The larvæ of the syrphid fly, *Xanthogramma grandicornis*, and of the agromyzid, *Leucopis nigricornis*, also prey on aphids and are usually found where aphids are abundant. . . . The cottony cushion or fluted scale, *Icerya purchasi*, which, while normally controlled by *Novius cardinalis*, sometimes becomes very abundant and does considerable damage before the ladybirds become numerous enough to clean it out. . . . Mealy bugs, embracing several species, infest legumes, notably *Pseudococcus longispinus*, *P. citri*, *P. virgatus*, and *P. fiamentosus*, but do little apparent damage and are usually controlled by their parasites and predators. The first 3 species have been noticed on pigeon pea and the last more especially on clover. The flat scale, *Saissetia oleæ*, is common on pigeon pea and crotalaria. The leaves of most of the cultivated legumes, and some other plants as well, are mined by the larvæ of *Agromyza diminuta*." It is thought that this miner will never be a serious pest since it is effectively parasitized by the eulophids *Omphale metallicus* and *Pediobius* sp. The bean pod borer, a caterpillar of the common butterfly *Lycæna bætica*, is thought to be the most injurious insect attacking legumes, and notes on its life history are presented.

"The dry pods and seeds of legumes are attacked in storehouses and somewhat in the field by certain insects which habitually feed on stored products, notably bruchid weevils. . . . *Bruchus chinensis* and *B. prosopis* have been bred from seeds of the pigeon pea, *B. chinensis* from seeds of the cowpea, and *B. prosopis* and *Caryoborus gonagra* from seeds of keawe (*Prosopis juliflora*). The ptinid beetle *Catorama mexicana* has been bred from seed of the velvet bean, and the common coffee bean-weevil (*Aræcerus fasciculatus*) from pigeon pea seed stored and in the field."

The minor pests observed include *Trichothrips nigricans*, which is abundant in the blossoms of the pigeon pea; *Xiphidium varipenne*, which sometimes feeds on legumes, but is largely carnivorous in habit; a red spider (*Tetranychus* sp.), noticed on the foliage; and bostrychids, which bore the broken stems. Observations of the capsid bug *Hyalopeplus pellucidus* failed to show any predatory inclination as previously reported to be the case.

Brief notes are also given on the occurrence and habits of the Mediterranean fruit fly.

A preliminary study of Kentucky localities in which pellagra is prevalent. H. GARMAN (*Kentucky Sta. Bul. 159, pp. 3–79, pls. 27, figs. 24*).—Within the past 2 years pellagra has attracted attention in some of the mountain counties of Kentucky from which a number of people have been sent to the state asylum at Lexington. At the request of a conference of medical men of the State the author visited the region where pellagra is prevalent with a view to determining whether any fly occurs there that might convey the disease. Several days were spent at Corbin in the latter part of August and in September, and at Pineville in October, in studying the localities in which pellagrous cases are located and giving special attention to the streams in the region as breeding places of the flies. The results of the investigation are here presented and discussed at length under the following headings: The streams, the insects, etc., found in the streams, including Simulidæ, Chironomidæ, Culicidæ, Tipulidæ, Tabanidæ, Hemiptera, Coleoptera, Trichoptera, Neuroptera, Ephemerida, Odonata, Plectoptera, Arachnida, Protozoa, Crustacea, Bryozoa or Polyzoa, Vermes, Mollusca, fishes and amphibians, also vegetation in and about the streams, and bacteria.

The work concludes with a discussion of the corn crops along the streams, the effect of moldy corn on stock, and the presentation of Dr. Sambon's theory of the transmission of pellagra by simulids.

The sand flies discussed are *Simulium venustum*, *S. pecuarum*, *S. pictipes*, *S. meridionale*, and *S. reptans*. The author states that he has not at any time committed himself to the insect theory of the spread of pellagra, is not satisfied with the evidence, and in this bulletin has simply presented facts which may bear upon the problem.

The pear thrips, P. J. PARROTT (*New York State Sta. Bul. 343, pp. 3–28, pls. 5, figs. 5*).—This is a report of investigations of *Euthrips pyri*, which, as reported in the account previously noted (E. S. R., 25, p. 658), has become the source of considerable injury to fruit at points in the Hudson River Valley, as well as in California (E. S. R., 24, p. 455).

The author concludes from investigations conducted that the pest has been a source of injury in the Hudson River Valley for a period of some 5 years. "The most severe attack of the thrips occurred during 1910, when the pear crop in many orchards was much reduced. Besides losses in yields the trees were seriously checked by injuries to leaf buds and leaf clusters; and in some orchards the season was much advanced before the trees presented normal conditions of growth. The productiveness of pear orchards during 1911 was greater than the preceding year, but blighting of blossom clusters was general and orchards suffered losses in yields according to the severity of the attacks by the thrips."

"The adult insect attacks the developing buds, which checks the natural growth, and blossom clusters most seriously affected eventually fall. The deposition of eggs in the fruit stems weakens the stems, causing the young fruit to drop. The quality of prunes that mature may also be impaired by the feeding of the larvæ on the skin of the fruit causing a diseased condition known as 'scab.' The Napoleon Bigarreau and Black Tartarian cherries and Imperial prune are among the varieties known to New York fruit growers that are attacked by the thrips. Almonds, apricots, and peaches, while also subject to injuries, do not usually sustain such serious losses unless the thrips are very numerous." During 1911 it was observed in New York chiefly on apples, apricots, cherries, peaches, pears, plums, and quinces. "Apples were generally infested with thrips, but the destruction of blossom clusters was not so common as with the pears. In spite of the presence of large numbers of the thrips in the buds there was usually a large setting of apples. While all of the leading commercial varieties

were more or less infested by the thrips, the most conspicuous injuries to blossom and leaf clusters during the past season were observed with such varieties as Astrachan, Gravenstein, McIntosh, Ben Davis, and Oldenburg."

The life history of the pest is described, together with technical descriptions of its stages. "The date when the mature insects first appeared on the trees this spring was not obtained, but a few specimens were observed on April 26. They seemed to be most numerous and destructive from April 28 through the first week in May. With the falling of the petals from May 11 to May 14 the adults became less numerous on pear trees, and practically disappeared from plantings of this fruit by the latter part of the month. Oviposition was most active during the last few days of April and up to the middle of May. The first young thrips was detected on May 9, and on succeeding days larvæ emerged in large numbers, being very conspicuous in the calyx basins of the fruit following blossoming. The latest date of emergence of larvæ was May 25. The young thrips commenced to drop to the ground beneath the trees on May 17, when several of them were caught on sheets of sticky fly paper."

The actual range of distribution in New York has not been ascertained. While its destructiveness to pear orchards has attracted the attention generally of pear growers about North Germantown, Germantown, and Cheviot, scattering numbers of the insect have been observed on pears grown south of this region, about Tivoli, to the north about Stuyvesant, and eastward to a line running between Chatham, Glencoe Mills, and Clermont. On April 26 specimens of thrips were found at Geneva in apple buds, which plainly showed evidences of injury.

The author's experiments show that "the period for effective spraying is during the time when the buds are breaking and until they are entirely opened at the tips. The most promising spraying mixtures are the nicotin preparations in combination with kerosene emulsion or soap. Two or 3 applications on successive days during the past year largely prevented important injuries to pear trees. The physical features of the locations of the orchards, such as the direction and elevation of the slopes of the land, proximity to the Hudson River and character of the soil, have a marked influence on the development of the buds and the time of blossoming. The time for effective spraying will therefore vary with individual orchards."

A new fruit tree enemy in New York, F. H. Hall (*New York State Sta. Bul. 343, popular ed., pp. 8, fig. 1*).—A popular edition of the above.

The grape leaf-hopper and its control, F. Z. Hartzell (*New York State Sta. Bul. 344, pp. 29–43, pls. 4, figs. 3*).—This paper treats of *Typhlocyba comes*, its life history and habits, food plants, and injury, with a brief report of experimental control work, conducted in continuation of that previously noted (E. S. R., 24, p. 751).

This important enemy of the grape is said to have been on the increase in Chautauqua County during the past few years. It "weakens the vines by piercing the epidermis of the underside of the leaf and sucking the cell sap, thus injuring the cells and exposing them to the drying action of the air. This injury results in a decrease in the amount of wood, and it also affects the quantity and quality of the fruit. Fruit from badly infested vines is poorly ripened."

"Experiments have proven that a spray containing 0.02 per cent nicotin is the most effective and safest contact insecticide for the control of the grape leaf-hopper. This must be directed against the nymphs, which are hit by applying the spray to the undersides of the leaves.

"The application of the spray for this insect can be done by the usual hand spraying with trailing hose or by an automatic leaf-hopper sprayer which is described in this bulletin. This latter device was developed during the past

season and it has done efficient work. With high pressure and proper adjustment of the nozzles the insect can be efficiently controlled."

Fighting leaf-hoppers in the vineyard, F. H. HALL (*New York State Sta. Bul. 344, popular ed., pp. 8, figs. 3*).—A popular edition of the above.

Burn the chinch bug in winter quarters, T. J. HEADLEE (*Kansas Sta. Circ. 19, pp. 8, figs. 7*).—This circular calls attention to the fact that it is imperatively necessary for the farmer to determine in the fall whether his grasses are harboring a dangerous number of chinch bugs, and to the importance of burning infested grasses late in the fall or early winter, as most of the bugs not killed by the fire perish from exposure.

Records made of the average winter mortality in different types of cover are as follows: Bunch grass 65 per cent; big bluestem 65 per cent; dry pieces of manure 98 per cent; Osage oranges 99 per cent; rubbish, leaves, etc., 99 per cent; turnips 99 per cent; corn husks and stalks 100 per cent; and Osage orange tree bark 100 per cent.

The great value of winter burning was demonstrated in the fall of 1910 in an area of 25 square miles in northern Sumner County. "During the months of November and December, 1910, a rectangular block, 3½ miles wide by 5 miles long, was stripped of its chinch-bug cover by fire and the remaining 7½ square miles were more or less completely burned. Although the burning was not as close as was desired, the average length of the stubble being 1.5 in., whereas it should have been less than 1 in., an average of 738 bugs out of every thousand present when the firing began were destroyed, and this mortality was raised to 984 per thousand by the first of the following March."

"From the time the bugs appeared in the wheat in the spring, as an average, they were from 6 to 20 times more numerous in the unburned district than in the burned sections. . . . The yield of the burned area averaged about 2.1 bu. more per acre than that of the unburned, showing that a saving of about $7,000 was effected in wheat alone. Oats, being only slightly infested, showed little difference in yield. In the burned area the reduction of bugs was so great that no corn was killed at harvest time, while in the unburned area from 1 to 40 rows standing adjacent to wheat were sucked dry and completely ruined."

A map is given of the burned area and surrounding territory.

The San José scale in Missouri, L. HASEMAN (*Missouri Sta. Bul. 98, pp. 61–116, figs. 16*).—This is a general account of the San José scale, its history and introduction into Missouri, provisions for its control in Missouri, present distribution in the State, life history and appearance, development, reproduction, period of larval activity, methods of spread, food plants, injury, natural enemies, and remedial measures, with a brief report of control experiments.

The scale was first introduced into Missouri between 1891 and 1894. At the present time infestations have been located in one-third of the counties of the State, though the bulk of the scale is confined to some 6 counties. "The nurseries of the State so far as examined had remained apparently free of the scale until 1906, but since then slight infestations have been found in 3 or 4 small local nurseries and in 3 of the larger ones, but in each case it has been stamped out. . . .

"The lime-sulphur wash is by far the cheapest on the market, and when properly prepared and applied is just as effective for the control of the scale as any of the other washes, besides being an excellent remedy for plant lice and having fungicidal properties. . . . Of the 4 miscible oils tested it is impossible to detect any difference in their effect upon the scale. A fall and spring application of either of them at a strength of 1:15 is thoroughly effective. They should not be used at a greater strength except when only one application can be given, when 1 gal. of oil to 10 or 12 gal. of water will prove effective.

They should never be used at a greater dilution than 1:15. Summer spraying for the control of the scale with any of the washes so far tested is impracticable.

Papers on insects affecting vegetables.—The imported cabbage webworm (Hellula undalis), F. H. CHITTENDEN and H. O. MARSH (*U. S. Dept. Agr., Bur. Ent. Bul. 109, pt. 3. pp. 23–45, figs. 4*).—Since 1897 this webworm has repeatedly come under observation as a pest in additional States and Territories, namely, in Florida, Mississippi, North Carolina, Texas, California, and Hawaii, the reports of which are here presented. Technical descriptions of its stages are given in connection with life history notes.

A total of 296 eggs is recorded as deposited by a single female. At a temperature of from 80 to 84° F. the eggs hatched 3 days after deposition. "Besides cabbage, turnips and beets, collards, cauliflower, kale, rutabaga, radish, kohlrabi, mustard, rape, horse-radish and some other cultivated plants, such as 'Japanese radish,' are subject to attack and injury. Among weeds and wild food plants are the common sheperd's purse (*Bursa* [*Capsella*] *bursa-pastoris*), and 'pussley' or 'cutter's grass,' otherwise purslane (*Portulaca oleracea*)." The natural enemies mentioned include 2 tachinids (*Exorista pyste* and *Plagiprospherysa* sp.), an ichneumonid (*Limnerium tibiator*), and 2 other hymenopterous parasites, namely, *Meteorus vulgaris* and *Temelucha* (*Porizon*) *macer*.

Notes on the occurrence of the pest in Hawaii, together with a report of remedial experiments conducted by the junior author, follow, together with a list of the other enemies of cabbage in Hawaii.

"At Honolulu eggs have been observed to hatch in from 2 to 3 days. . . . The larvæ usually reach maturity in from 13 to 15 days. They then leave the plants, burrow slightly beneath the surface of the soil, and form rather frail cocoons of webbed-together grains of earth, within which they pupate within 2 days. . . . The adults usually issued in from 6 to 12 days after pupation. . . . Four generations of this webworm were reared in an insectary at Honolulu." One female lived in a cage for 10 days and deposited 235 eggs, while another lived 14 days and deposited 237 eggs.

It is concluded from the experiments reported that arsenicals can not be depended upon to control this species on cabbage. "In light of our present knowledge, the best methods of controlling this webworm consist of clean culture, the screening of seed beds, and thorough cultivation. The necessity of prompt destruction of crop remnants and the employment of other clean cultural methods can not be too strongly emphasized. . . . By screening the seed beds it is possible to prevent infestation until the time of transplanting. When this method is followed it is advisable to leave a few plants exposed near the screened beds [as traps]. . . . Inasmuch as the larva of this species pupate in frail cocoons near the surface of the soil, it is possible that thorough cultivation would crush some of the pupæ and at the same time induce a more vigorous growth of the plants."

A bibliography of 22 titles is appended.

Papers on insects affecting vegetables.—A little-known cutworm (Porosagrotis vetusta), F. H. CHITTENDEN (*U. S. Dept. Agr., Bur. Ent. Bul. 109, pt. 4, pp. 47–51, fig. 1*).—Reports received of the attack of this pest at Southern Pines and Poplar Branch, N. C., and Norfolk, Shelton, and Churchland, Va., in which vegetables, berries, and field crops were injured, are first considered. Brief descriptions are then given of the moth and larva: the eggs and earlier stages of the larva have not been observed. *Apanteles* n. sp., near *agrotidis*, and the tachinid fly *Linnæmya picta* are said to be the only enemies of this insect that are known at the present time.

At Norfolk, Va., the use of arsenate of lead, 4 lbs. to 50 gal. of water, gave good results in combating the pest on parsley.

The fruit tree leaf-roller (Archips argyrospila), G. W. Herrick (*New York Cornell Sta. Bul. 311, pp. 279–292, pls. 4, figs. 3*).—As noted in a previous account (E. S. R., 26, p. 758), this leaf-roller suddenly came into prominence in the spring of 1911 as a serious pest to apples and a minor one to pears in New York orchards.

The species was first described as of economic importance in 1869 when Packard reported it as attacking the cherry tree, but eastern growers have been comparatively free from its ravages. It has been bred by the author from larvæ on the apple, pear, sweet cherry, wild cherry, black walnut, and mountain ash. At Bethany Center the larvæ were found in abundance on plum, pear, quince, apple, and cherry trees.

"The larvæ appear as the buds are bursting, and begin to attack the unfolding leaves. They bend the leaves over and tie them together with silk. Within this sort of nest the larvæ live and eat the leaves. As soon as the blooms appear the larvæ begin to eat off the blossom stems and tie them together with silken threads, along with the leaves surrounding the blossom cluster. This webbing and tying together of the blossom clusters is a most pernicious habit because it interferes seriously with spraying for the codling moth. In one Baldwin orchard in which the larvæ were very abundant, the blossom clusters were so webbed together and covered over with silk, dried petals, and leaves that it was almost impossible to get the spray mixture into the calyx cup. As soon as the young apples or pears begin to set they are tied together with silk, while the larvæ live inside and gnaw cavities into the sides of the young fruit. . . . In New York orchards during the past season a very large number of pears and apples were totally destroyed by the larvæ, and many others were seriously marred and deformed. . . . The larvæ also work on the leaves, rolling them and living within the roll. Here, effectually hidden, they feed on the tender tissues of the leaves."

The pest undoubtedly passes the winter in New York State only in the egg stage, one generation a year apparently being the normal habit. The eggs are laid in June in small oval convex patches on the bark of the smaller twigs, the major number being deposited during the middle days of the month. The eggs remain on the trees until the following May, or a period of more than 10 months. In 1911, eggs hatched as early as May 4 and were found hatching in the field in abundance on May 9.

"When the larva becomes full-grown it spins a very thin, flimsy web in a rolled leaf, or between the leaves that are tied together, and changes to a pupa. . . . In the cages in the insectary the pupal stage lasted 9 to 12 days. . . . Our records during the season of 1911 show that the moths were emerging nearly every day from June 5 to June 21, with the latest moth appearing June 24. . . . It is evident that by the middle of June the moths were emerging in greatest numbers and that they were almost entirely out before July."

Four species of hymenopterous parasites were reared from larvæ and pupæ in cages. Many primary and secondary parasites and at least 1 tertiary parasite were reared in the field. *Pimpla conquisitor* was the parasite reared in greatest numbers, the others being *Amicroplus* sp., *Phytodietus vulgaris*, *Sympiesus* sp., *Pimpla inquisitor*, *Glypta simplicipes*, and *Carcelia nigropalpus*.

Methods of control have been summarized by the author as follows: "We would advise a thorough drenching of the trees with lime-sulphur at scale strengths for a dormant spraying to prevent the eggs from hatching, provided one is going to spray for the San José scale or the blister mite; we are not yet ready to recommend a spraying for the eggs of the leaf-roller alone. This application should be made as late as possible in the spring before the buds burst. We would advise a thorough spraying with arsenate of lead at the rate

of 2½ to 3 lbs. to 50 gal. of water, before the buds burst but while they are swelling or just as the tips begin to show green, and again before the flower buds open. These applications will also catch the bud-moth larvæ, which are serious pests."

The report concludes with brief notes on 2 closely allied species, namely, the oblique-banded leaf-roller (*Archips rosaceana*), and the ugly-nest leaf-roller (*A. cerasivorana*). A partial bibliography consisting of 41 titles is appended.

The alfalfa gall midge (Asphondylia miki), F. M. WEBSTER (*U. S. Dept. Agr., Bur. Ent. Circ. 147, pp. 4, figs. 6*).—This circular has been prepared in order to direct the attention, especially of alfalfa growers in the southwestern portion of the country, to the appearance of this foreign insect in the United States. It can not be predicted at the present time what injury this insect will cause in the United States, though it has not so far proved destructive.

Galls, from which this insect was afterward reared, were first found in limited numbers at Sacaton, Ariz., in June, 1909. They were found about Tempe and Phoenix, Ariz., in June, 1911, and at Tularosa, N. Mex., in July of the same year. A translation is given of the original descriptions of the gall as found in alfalfa fields in the vicinity of Vienna, Austria.

While but little definite information has been gained in relation to the pest, it apparently winters in the pods. So far as now known its breeding season during summer is rather short, as it has not been noticed earlier than late May or later than September. The source of its entrance into this country remains obscure, but the author suggests that it may be working its way from Mexico northward. That it is preyed upon extensively by parasitic insects, although the parasites are all new to science and have never been described, is thought to imply a rather long residence in this country. "The indications are that it is spreading over the alfalfa-growing sections of the extreme Southwest, but it does not necessarily follow from this that it will prove so destructive as have many other insects coming to us from across the Atlantic Ocean. . . .

"Mowing the alfalfa just as the plants are coming into bloom will doubtless keep the numbers of the midge much reduced, as this method tends to prevent development, and, therefore, to curtail increase in numbers."

Papers on insects affecting vegetables.—Arsenite of zinc and lead chromate as remedies against the Colorado potato beetle, F. A. JOHNSTON (*U. S. Dept. Agr., Bur. Ent. Bul. 109, pt. 5, pp. 53–56*).—This is a report of a series of experiments conducted in cooperation with the Virginia Truck Experiment Station in which the insecticidal value of arsenite of zinc and of lead chromate was compared with that of other arsenicals.

"The results obtained from the use of lead chromate were very unsatisfactory as compared with those in the case of other insecticides used. The lead chromate employed was in the form of a powder, and great difficulty was experienced in making it mix well with water, it having a tendency to settle quite rapidly, requiring constant agitation to keep it in solution. It adhered well to the foliage, and its color stood out quite prominently in contrast to the other plats. However, the young larvæ seemed to be able to feed on plants that were thoroughly covered with the material without receiving much injury.

"The arsenite of zinc employed was also in the powdered form. It is much lighter than lead chromate and remains in suspension in water much better. It adheres to the foliage very well and does not, so far as could be observed, burn or injure the plants in any way." In experiments with arsenite of zinc at the rate of 1, 1½, and 2 lbs., respectively, to 50 gal. of water, by far the best results were obtained where 2 lbs. of the arsenite was used. "Without doubt

an even greater amount of the arsenical might be used without injury to the plants and with correspondingly greater efficiency in killing the beetles."

Papers on cereal and forage insects.—The so-called "curlew bug" (Sphenophorus callosus), F. M. WEBSTER (*U. S. Dept. Agr., Bur. Ent. Bul. 95, pt. 4, pp. 53–71, pls. 4, figs. 6*).—This is a summarized account of the present knowledge of *S. callosus* and includes information received from correspondence and recent studies by agents of the bureau.

This beetle was first described by Olivier in 1807 from "Carolina." Bureau notes here presented, dating from 1880 to the present time, show it to have been the source of injury at various points in Virginia, North and South Carolina, Georgia, Oklahoma, and New Mexico. It seems to center in point of abundance in eastern North Carolina, extending southward to southern Florida, northward to Maryland, thence northwest to northwestern Illinois, southwest to extreme southeastern Arizona and northern Mexico, and eastward to the Gulf coast. It is essentially a lowland form as its food plants clearly indicate, swamp and other low-lying lands being particularly subject to attack.

In addition to the cultivated food plants, corn, rice, and peanuts, the species has been found to feed upon *Cyperus strigosus*, *C. vulpinoidea*, *C. esculentus*, *C. rotundatus*, *C. exaltatus*, *Tripsacum dactyloides*, *Panicum capillare*, and *Carex frankii*.

Life history notes are given, together with descriptions of the egg, larva, pupa, and adult. The egg period was found to vary from 4 to 6 days in June and July and from 6 to 8 days in September. In one case 58 eggs were secured from one female. In North Carolina the eggs appeared to be deposited from June 1 to September 20, or during a period of approximately 4 months. The eggs are placed in the corn plant above the roots. Upon hatching the larva works downward, through the center of the lower stem and into the main root or taproot and, unless this is entirely eaten away, probably finishes its development there. While the insect is not aquatic, it is capable of living and developing on submerged plants without suffering material inconvenience therefrom. In cornfields it is often found working several inches below the surface of soil thoroughly saturated with water. While the corn is injured by adults and larvæ, attacks by the latter are by far the most fatal to the plant.

Studies conducted at Wellington, Kans., show that the larval stage may occupy from 37 to 41 days. The adult beetle is reported to have issued September 1 from a larva which transformed to a pupa August 22. "The adults evidently hibernate to some extent in corn in the chamber in which they have developed, but seemingly lower down than in the case of *S. maidis*. . . . The numbers found, however, were far too limited to indicate that this can be true of even the majority, the others probably wintering over either in or near the surface of the ground. . . . The beetles probably come forth from their hibernation quarters quite early in spring, as soon as the ground has become permanently warm from the spring temperature. . . . They evidently feed for a considerable time by puncturing the lower part of the stems of the plants. These punctures are quite different from the egg punctures, and the effect is often not so fatal as that occasioned by the downward burrowing of the larva. These punctures are usually made about or a little below the surface of the ground, the beetle evidently searching for a point where the stem is tender and succulent. If the punctures are made lower down on the plant just above the root, the result is a throwing up of a number of tillers or suckers from the roots, the main stem itself having a stalky appearance, with the result that no ears are produced."

An instance has come to notice which seems to indicate that the beetles can survive not only in fresh water but also in salt water. The author's attention

was called to the fact that where corn had followed cotton crops no damage was apparent but where the preceding crop had been corn, the damage was in many cases very severe, often resulting in a total loss of the crop.

The night hawk (*Chordeiles acutipennis texensis*) and the predaceous maggots of the robber fly *Erax lateralis* are mentioned as natural enemies of this beetle. It appears evident that the beetles winter in the fields where they develop and that crop rotation is effective in preventing serious injury.

Progress and prospects of tick eradication, C. Curtice (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910, pp. 255–265, fig. 1; Circ. 187, pp. 255–265, fig. 1*).—In this paper the author briefly discusses the beginning of tick eradication, the results of 5-years' work, obstacles to progress, reasons for tick eradication, and prospects for the future.

In summarizing the eradication work it is stated that at the time of writing "there have been freed of ticks and released from quarantine 127 counties and parts of 20 counties out of 929 originally infected; 90 are in varying degrees of disinfection. Over one-seventh of the counties have been cleaned, and over one-fifth of all the originally infected counties have been worked in. About one-tenth of the counties now infected are being worked in and are partially clean."

The use of arsenical dips in tick eradication, B. H. Ransom and H. W. Graybill (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910, pp. 267–284, pls. 6, fig. 1*).—This paper is based upon the investigations previously noted (E. S. R., 27, p. 84).

A new leakage gage, C. W. Woodworth (*California Sta. Circ. 75, pp. 15, figs. 8*).—This is the sixth of the author's papers on fumigation studies (E. S. R., 26, p. 561).

A new method of determining the leakage in fumigation work, through the use of a leakage gage which the author has invented, is here described. This new gage consists of a tent clamp and a set of 3 tubes, 1 of brass ending in a nipple for attaching a rubber mouthpiece, and the other 2 of glass, along 1 of which is a scale so graduated as to show the percentage of leakage, and a small glass chamber of water with which the 3 tubes communicate. The graduated tube is closed at the top but has a passage to the clamp ring which allows air to pass through the tent cloth. The other glass tube is open at the top.

The method of determining leakage is as follows: The glass chamber is filled partly full of water and a double thickness of the tent is clamped into the clamp ring, the tester blows gently through the rubber mouthpiece on the brass tube until the water rises to the top of the open glass tube, then the percentage of leakage is read on the scale where the top of the water column reaches in the closed glass tube.

The theory upon which most methods of measuring leakage is based is that the rates of leakage of gas through different pieces of cloth will show approximately the same difference that is found between the rates of flow of air through these cloths when it is forced through under the same pressure. The method used in this apparatus is to measure the resistance to the passage of air presented by the cloth to be tested as compared with an opening of a known size. The scale is graduated between 0 and 100 per cent leakage by testing in the gage a series of metal disks containing holes of different known area and determining the ratio of their areas to the area of the clamp ring.

Pressure gages for determining leakage were found to be more practical than volume gages, a test tube gage being the simplest form of pressure gage. A suction gage, which was the most satisfactory form used in the laboratory, requires a special form of regulating clamp. The use of a tester enables one

to be sure of the proper adjustment of the instrument. A combined instrument, containing both tent clamp and gage, is recommended for field work.

Leakage through the weave of the cloth was found to be much more important than that through visible holes.

Other phases discussed are the method of stating leakage and leakage in torn tents.

FOODS—HUMAN NUTRITION.

Economic results of cold storage, JAMES WILSON (*U. S. Dept. Agr. Rpts. 1911, pp. 25–34*).—A special investigation was undertaken by this Department, in which detailed information regarding the cold storage industry was collected by means of schedules submitted to the cold storage warehousemen, and prices were compiled from the literature of the subject for the last 30 years. The particular object was to secure data regarding fluctuations in prices before cold storage existed or was of considerable importance, and to compare such data with fluctuations in recent years during which the business has grown to large proportions. On the basis of the information collected, such questions are considered as the length of time commodities remain in storage, the principal months when they are received, the percentage held for longer than a year, the average length and the costs of storage, the tendency to uniformity of prices throughout the year, speculation, and stored goods as a percentage of consumption.

In 1910–11, 47 per cent of the fresh beef placed in cold storage during the year was received during September, October, and November; similarly, 59.8 per cent of the fresh mutton was received during August, September, and October; 59.2 per cent of the dressed poultry during November, December, and January; 70 per cent of the butter during June, July, and August; and 79.4 per cent of the eggs during April, May, and June. As regards delivery, "the important observation to be made is that the receipts into cold storage are entirely or very nearly exhausted by the deliveries within 10 months."

With respect to costs of storage, "it is evident that as the time of storage lengthens, the costs and their percentage of the wholesale price must be multiplied by the number of months. If the storage is for 15 months, for instance, the cost per pound ranges from 5.273 cts. for fresh mutton to 8.572 cts. for butter, and is 8.898 cts. per dozen for eggs; the costs for 15 months range from 36.5 per cent of the wholesale price in the case of butter to 57.5 per cent in the case of fresh mutton. For the average length of time in cold storage, as ascertained in this investigation, the actual costs are for fresh beef, 0.997 ct. per pound; fresh mutton, 1.564 cts. per pound; fresh pork, 0.35 ct. per pound; for poultry, 1.079 cts. per pound; for butter, 2.532 cts. per pound; for eggs, 3.505 cts. a dozen. The costs of storage for the average length of time are 7.9 per cent of the wholesale price for fresh beef; 17.1 per cent for fresh mutton; 3.2 per cent for fresh pork; 6.8 per cent for poultry; 10.8 per cent for butter; and 18 per cent for eggs. Approximately, the wholesale prices of the commodities mentioned are increased by cold storage to the extent of the percentages just given."

Cold storage has influenced considerably the relative monthly consumption of commodities and has made it more even throughout the year. "There has also been a change in relative monthly prices, due to cold storage. In the case of eggs the relative price has increased in the season of natural plenty and diminished in the period of natural scarcity. . . . In the cases of both butter and eggs the annual price level has been raised by cold storage, for a reason apart from the costs."

With respect to the tendency to uniform prices throughout the year, an examination of the data collected regarding the range of prices indicates "a tendency toward uniformity of prices with regard to butter, eggs, poultry, and fresh mutton, and a tendency away from uniformity with regard to fresh beef and fresh pork."

With regard to the extent of the cold storage enterprise, the report points out that "this business of storing foods has grown to such proportions that consumers have a rightful concern with its management for economic as well as sanitary reasons. From the returns made to this Department by the cold-storage warehousemen, it is inferable that the fresh beef, fresh mutton, fresh pork, poultry, butter, eggs, and fish received into cold storage in a year amounts to a weight of at least 1,000,000,000 pounds and very likely to a quarter of a billion more. The eggs received into storage in a year are approximately 13½ per cent of the farm productions; the fresh beef is over 3 per cent of the census commercial slaughter of cattle; mutton over 4 per cent of that slaughter of sheep and lambs; fresh pork 11½ per cent of that slaughter of hogs; and butter 25 per cent of the creamery production."

From the investigation as a whole, the following recommendation is made with reference to publicity: "This is no indictment of the men who keep foods in cold storage except in so far as they sometimes speculate, nor need they be indicted for offenses in order that the public economic interest in their business may be made to appear. . . . The man who places food in cold storage is somewhat in the situation of the man who forestalls the market. He may not attempt to do so, but the power may be a temptation.

"The affairs of such a business as this should have publicity. The public ought to know how much goods are in storage from month to month and what the movements of receipts and deliveries are.

"The food warehousemen should be required to send to Washington monthly reports containing the desired information. Here these reports could be promptly aggregated and the results could be given to the public on a previously announced day of the month, somewhat as the crop reports are."

An inquiry into the cost of living in Australia, 1910–11, G. H. KNIBBS (*Noted in Jour. Soc. Statis. Paris, 53 (1912), No. 3, p. 163*).—Statistics regarding the expenditures of 212 Australian families with an average income of $100 per month are here summarized. The weekly expenditures for food for individuals of different age and sex are found to stand in practically the same proportion to each other as the figures given by Atwater to represent the relative nutritive demands of individuals of different age and sex.

[Food analyses and other pure food and drug topics], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul., 2 (1912), Nos. 2, pp. 17–32; 3, pp. 33–48*).—The first of these bulletins contains data regarding the registration of beverages, the examination of crackers, biscuits, and similar goods, miscellaneous food products, and proprietary articles, and a discussion of a number of matters relating to pure foods.

The second bulletin contains some data regarding the registration of beverages, the examination of kippered herrings from a corroded can with reference to the tin, lead, and zinc present, analyses of "crisco," a commercial fat, and canned goods, the examination of miscellaneous food products, and analyses of waters.

A paper by T. Sanderson reports a comparison of the milling quality of samples of hard red spring wheat and hard red winter wheat. The data showed that from a milling standpoint the winter wheat is superior to the spring wheat and produces the largest amount of flour per bushel, with the smallest loss in milling. The 2 types of wheat, it is noted, are very similar in their general

characteristics, so much so that they require about the same treatment during tempering and milling. The growing of some winter wheat is recommended.

A comparative test is also reported of the baking strength of northern grown hard red winter wheat and hard red spring wheat. The results showed that the spring wheat produced a bread slightly superior as regards absorption, baking strength, color, texture, and protein content of wheat and flour, the greatest differences being with respect to baking strength (loaf volume) and protein content. The results as a whole are not regarded as unfavorable to the winter wheats.

The bulletin also reports a test by R. E. Remington on the immersion refractometer as a rapid means of approximating the solids in vinegar (see page 112), and discusses miscellaneous pure food topics.

Studies on wheat flour.—I, Influence of the concentration of hydrogen ions on the baking value of flour, II. JESSEN-HANSEN (*Compt. Rend. Lab. Carlsberg, 10 (1911), No. 1, pp. 170–206, dgms. 4*).—The well known fact that the acid content of flour exerts an influence, not only on the specific gravity of bread but even more on its general quality, led the author to the conclusion that there exists an optimal concentration of hydrogen ions for the baking value of flour in general, or, in any case, that such concentration is capable of explaining the different properties which make up the baking value of flour. To test this theory, he conducted a series of baking tests with different flours, the conclusions being drawn from the average for 12 loaves in each case. The work is not yet complete, but on the basis of that accomplished, the author presents the following conclusions:

The optimal concentration corresponds approximately to the expanding of hydrogen ions $ph=5$. For the fine flours it is slightly higher; for the poorer varieties slightly lower.

Of the different milling products from the same grain, the finest flour, that is, that coming from the central portion of the grain, presents the greatest acid, or the greatest concentration of hydrogen ions, while the bran, which is the least acid, presents the least concentration of hydrogen ions.

The various artificial methods of improving the baking quality of flour which have been advanced recently have practically no other effect than that of increasing the concentration of hydrogen ions in the dough.

Measuring the gluten extracted by washing is deemed of no value in determining the baking value of a flour.

The proteins of rice, S. KAJIURA (*Bio-Chem. Jour., 6 (1912), No. 2, pp. 171–181*).—The article reports unfinished studies on the proteins of rice, from which the following conclusions are drawn:

"The proteins of 'white rice,' as used for dietary purposes in Japan, consist only to the smallest extent of albumins and globulins. The amount of alcohol-soluble protein is practically negligible, thus distinguishing rice sharply from all other cereals hitherto investigated. The main protein of rice, oryzenin, belongs to the glutelin class (proteins soluble in dilute alkali). In its nitrogen partition it differs from wheat glutenin (the only other glutelin so far studied) very considerably."

The toxicity of caffein—an experimental study on different species of animals, W. SALANT and J. B. RIEGER (*U. S. Dept. Agr., Bur. Chem. Bul. 148, pp. 98*).—The results are reported of an extended experimental study with rabbits, guinea pigs, cats, and dogs of the toxicity of caffein administered by mouth, by subcutaneous injection, and injection in other ways. There is also a historical review of the literature of the toxicity of caffein and a bibliography.

The report is the first of a proposed series, and it is pointed out that the conclusions are in some particulars to be regarded as tentative.

Quotations from the authors' summary follow:

"The toxicity of caffein in the rabbit varies with the mode of its administration, being least when given by mouth and greatest by intravenous administration. The toxicity is from 15 to 20 per cent greater by subcutaneous injections than by mouth, but is about half of that when injected into the peritoneal cavity. . . .

"The resistance of the guinea pig to caffein, as of the rabbit, is greatest when given by mouth. . . . The adult cat is less resistant than the guinea pig or rabbit to caffein. . . . The minimum fatal dose for dogs was found to be the same by mouth as by subcutaneous injection and is almost the same as for the cat. The toxicity of caffein varies in the guinea pig according to season of the year.

"Age is likewise a factor in the toxicity of caffein, young animals being more resistant than the full-grown and older animals; this was shown in experiments on rabbits, cats, and dogs. The symptoms of caffein poisoning also were different in puppies and in full-grown dogs. Different diets, such as carrots and oats, did not influence the resistance of rabbits and guinea pigs to caffein. Low protein diet tends to decrease resistance to caffein in dogs. Young growing dogs are less resistant to caffein on a meat than on a milk diet. Caffein is not cumulative in the rabbit or dog, even if administered for a considerable length of time. Some degree of tolerance may be induced in the rabbit under certain conditions, but not in dogs under the conditions of the experiments made in this investigation. . . . The toxicity of caffein is probably increased under pathological conditions, since comparatively smaller doses were fatal to rabbits, cats, and dogs, when marked lesions not due to caffein were found at autopsy. Glycosuria was observed in rabbits, guinea pigs, and cats when caffein was given in sufficient amounts."

See also a previous note (E. S. R., 25, p. 470).

Coca cola (sirup), A. McGill (*Lab. Inland Rev. Dept. Canada Bul. 232, 1912, pp. 11*).—A summary of the analyses of 68 samples of the sirup made to determine their cocaine and caffein content is given. No trace of cocaine was found in any, while the amount of caffein varied from 0.15 to 0.72 of a grain per ounce, the average being 0.60.

State and municipal meat inspection and municipal slaughterhouses, A. D. Melvin (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910, pp. 241–254, dgms. 4; Circ. 185, pp. 241–254, dgms. 4*).—Inasmuch, as is stated, only a little more than one-half of the total meat supply of the United States is subject to the Federal inspection, the need for State or local inspection is pointed out, and the problems of local inspection are discussed. The municipal or central slaughterhouses recently erected in Paris, Tex., and Nashville, Tenn., are described and plans and specifications given for a central abattoir and septic tank.

The hourly chemical and energy transformations in the dog, after giving a large quantity of meat, H. B. Williams, J. A. Riche, and G. Lusk (*Amer. Jour. Physiol., 29 (1912), No. 4, Proc. Amer. Physiol. Soc., 24 (1911), pp. XXXIII, XXXIV*).—The experiments here reported were carried out in a calorimeter of the Atwater-Rosa type. A dog fed 700 gm. of meat at noon of the previous day was placed in the calorimeter chamber between 10 and 11 a. m., and his metabolism measured. At 12 m. the animal was given 1,200 gm. of meat and again placed in the apparatus. The heat production and other factors of metabolism were determined hourly for 20 hours.

"It was found that the direct and the indirect calorimetry agreed perfectly.

"It was found that the heat production rose largely, and that this increase in heat production was proportional to the nitrogen eliminated in the urine, and

was in no way proportional to the quantity of material present in the intestine. It was found that the carbon which was retained from the protein ingested must have been retained in the form of glycogen, since the absorption of oxygen during the different periods corresponded exactly with this assumption, whereas, if the carbon had been retained in the form of fat, the oxygen absorption would have been 10 per cent less than that found.

"Further experiments have shown that glutamic acid added to a standard diet does not increase the heat production in any way."

Investigations on the digestion of milk—gastric digestion of casein, L. GAUCHER (*Compt. Rend. Soc. Biol.* [*Paris*], *72* (*1912*), *No. 9, pp. 354, 355*).—Continuing previous work (E. S. R., 26, p. 662), the author studied the digestion of artificially separated casein in a dog with a duodenal fistula. Comparing the results with those of normal human digestion, he concludes that the digestion of casein corresponds to the final stage of the digestion of milk. He summarizes the process of normal milk digestion as follows:

Of 7 gm. of casein absorbed with 250 cc. of milk, 4 gm. passes immediately from the stomach in a liquid state, and 1 gm. in the form of a loose clot, while the remaining 2 gm. contracts and hardens rapidly. Energetic gastric movements are necessary to reduce them to a purée, under which form they leave the stomach from 1 to 1½ hours after ingestion.

Calcium absorption in the animal body from pasteurized and sterilized milk, J. ZIMMER (*Ueber Kalkresorption im Tierkörper bei Verwendung von pasteurisierter und sterilisierter Milch. Inaug. Diss.* [*Univ.*], *Strassburg, 1911, pp. 12; abs. in Hyg. Rundschau, 22* (*1912*), *No. 6, p. 364*).—Two dogs were fed with pasteurized, 2 with sterilized, and 3 with raw milk. The animals were killed from 2 to 2½ hours after the meal and the amount of calcium in the contents of various portions of the intestines was determined. The results do not indicate that these methods of treating milk greatly affect the amount of calcium assimilated.

Studies on water drinking.—XII, On the allantoin output of man as influenced by water ingestion, L. T. FAIRHALL and P. B. HAWK (*Jour. Amer. Chem. Soc., 34* (*1912*), *No. 4, pp. 546–550*).—Continuing previous work (E. S. R., 26, p. 360), the authors conducted experiments summarized as follows:

"When the diet of a normal man was supplemented by 900 cc. of water per day the average daily output of allantoin . . . was 0.0135 gm. for a period of 13 days. Upon increasing the water intake to 3,450 cc. per day for a period of 5 days, the average daily allantoin excretion was increased to 0.0173 gm. This constitutes an approximate 20 per cent increase. The daily value for a 5-day final period on the original 900 cc. water ingestion was 0.0122 gm.

"The increase in the allantoin output accompanying water drinking may indicate that the oxidative mechanism of the organism has been stimulated through the introduction of the large volume of water into the body, and that purin material which would ordinarily have been excreted in some less highly oxidized form has been oxidized to allantoin and excreted in this form. This interpretation is strengthened by the finding in this laboratory of a decreased uric acid output after the water ingestion of the subject (man) had been considerably increased.

"In view of the fact that the above interpretation is contrary to the current views regarding purin metabolism in the human organism, the authors make the interpretation tentatively until further experiments may be completed."

The utilization of yeast in the human organism, W. VÖLTZ and A. BAUDREXEL (*Biochem. Ztschr., 30* (*1911*), *No. 6, pp. 457–472; 31* (*1911*), *No. 3–4, pp. 355–357; abs. in Hyg. Rundschau, 22* (*1912*), *No. 4, p. 245; Ztschr. Untersuch. Nahr. u. Genussmtl., 23* (*1912*), *No. 4, 174*).—When 100 gms. of desic-

cated yeast from which the bitter principle had been removed by treatment with soda was added to a basal ration in a digestion experiment with a man, 86 per cent of the protein from the yeast was resorbed and 88 per cent of the energy utilized. The calculated physiological nutritive value was 74.8 per cent of the total energy. The coefficients of digestibility were organic substances 90, fat 70, cellulose 40, and nitrogen-free extract 100 per cent.

The place of retention or reconjugation of the amino acids in the body, A. WOELFEL (*Amer. Jour. Physiol., 29 (1912), No. 4, Proc. Amer. Physiol. Soc., 24 (1911), pp. XXXVIII, XXXIX*).—Dogs, which had been operated on a few days previously for Eckfistulæ, were used in these experiments. Their hepatic arteries were tied, and solutions of amino acids introduced into their washed out intestines.

All the urine excreted was collected and the animals bled completely. The blood was defibrinated and centrifuged, and the serum thus obtained had its albumin removed and was otherwise prepared for formol titration to test it for an increase in its amino nitrogen content over normal serum. The ammonia and the amino nitrogen in the urines were determined.

"The small increases of amino nitrogen in the blood and the small increases of formol titratable nitrogen in the urines were far from commensurate with the amounts of amino acid shown by determination to have been absorbed by the intestine. . . .

"That the amino acids are not removed from the blood with the fibrin in the defibrination, or that some constituents of the plasma or the blood corpuscles are not responsible for their disappearance, was shown by control determination.

"Tissues other than the liver, intestinal mucosa, and blood cells can take up amino acids from blood plasma. Since the tissues in general seem to have such an avidity for amino acids, it is fair to suppose that in them the amino acids can be utilized for the regeneration of albumins."

The physiology of phosphorus during growth, A. LIPSCHÜTZ (*Pflüger's Arch. Physiol., 143 (1911), No. 1–3, pp. 91–98*).—Basing his opinion on experiments with young dogs fed a diet low in phosphorus, the author concludes that the growing organism is able to make use of all available phosphorus, whether it is supplied in small quantities by the food or deposited in the less important organs of the body.

Biological significance of casein phosphorus for the growing organism, A. LIPSCHÜTZ (*Pflüger's Arch. Physiol., 143 (1911), No. 1–3, pp. 99–108*).—The author conducted experiments with growing dogs whose food contained no phosphorus except that supplied by casein. In his opinion the work is too incomplete to be conclusive, but indicates that the growing organism can obtain the inorganic phosphorus necessary for its supply from the organic phosphoric acid resulting from the cleavage of casein.

Microscopic studies on living smooth muscle, E. B. MEIGS (*Amer. Jour. Physiol., 29 (1912), No. 4, Proc. Amer. Physiol. Soc., 24 (1911), pp. XIV, XV*).—The experiments reported were made with amphibians and were intended to throw light on the question whether smooth muscle cells decrease in volume during contraction; the results "confirm this view."

The chemical constituents of the ash of smooth muscle, L. A. RYAN and E. B. MEIGS (*Amer. Jour. Physiol., 29 (1912), No. 4, Proc. Amer. Physiol. Soc., 24 (1911), pp. XV, XVI*).—The smooth muscle of the bullfrog's stomach was analyzed for potassium, sodium, phosphorus, and chlorin, together with parallel analyses of the ash of striated muscles from the same frogs. "The work indicates that smooth muscle contains somewhat less potassium and phosphorus and somewhat more sodium and chlorin than striated muscle, but the differences are much less marked than has sometimes been supposed.

"The chemical work was supplemented with microscopic study of fixed and fresh samples of the tissue analyzed as 'smooth muscle,' and it was found that 70 per cent to 85 per cent of its volume was smooth muscle fiber; about 5 per cent, extraneous connective tissue; and the remainder, interstitial spaces between the muscle fibers."

ANIMAL PRODUCTION.

Chemical investigations on maize silage, D. FERUGLIO and L. MAYER (*R. Lab. Chim. Agr. Udine, Ric. Sper. e Attiv. Spiegata, 3 (1909–10), pp. 65–90*).—Analyses of green maize and silage are reported.

The green forage contained 79.295 per cent of water. The other constituents on a dry-matter basis were as follows: Crude protein 8.419, pure protein 4, ether extract 2.173, invert sugar 14.296, sucrose 2.511, amids 1.96, pentosans 20.686, cellulose 28.248, ash 7.05, undetermined obtained by difference 12.88, and acidity 1.777 per cent.

The silage contained 78.77 per cent of water. The other constituents on a dry-matter basis were as follows: Crude protein 8.562, pure protein 2.56, ether extract 5, invert sugar 4.701, sucrose 0.273, amids 1.1, pentosans 19.13, cellulose 27.758, ash 6.4, undetermined obtained by difference 20.171, and acidity 6.905 per cent.

Ensilage of fodder, roots, and beet pulp.—Use of lactic ferments, L. MALPEAUX and G. LEFORT (*Jour. Agr. Prat., n. ser., 20 (1911), Nos. 42, pp. 488–490; 44, pp. 549, 550; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 1, pp. 195–200*).—The authors report experiments in fermenting beet pulp, distillery pulp, sliced mangolds, beet leaves, and corn silage with the ferment known as lacto-pulp. In the majority of cases there was a loss in nutrient elements, but the food was kept free from putrid ferments and in a sound condition both from the dietetic and hygienic point of view.

The actual state of our knowledge of silage, D. FERUGLIO (*R. Lab. Chim. Agr. Udine, Ric. Sper. e Attiv. Spiegata, 3 (1909–10), pp. 55–63*).—This is a review of recent investigations on this topic.

On the composition of hay damaged by rain, G. PATUREL (*Jour. Agr. Prat., n. ser., 23 (1912), No. 17, pp. 524–527*).—A number of analyses of damaged alfalfa, clover, and common hay showed a loss of from 15 to 35 per cent in dry matter. A feeding test also indicated a proportionate loss in nutritive value.

Chemical analyses of licensed commercial feeding stuffs, 1911, F. W. WOLL (*Wisconsin Sta. Circ. Inform. 30, pp. 98*).—This is a report of the feeding stuffs control for the year. Analyses are reported of oil meal, cotton-seed meal, cotton-seed cake, gluten feed, dried distillers' grains, hominy feed, wheat bran, standard middlings, flour middlings, red dog flour, germ middlings, mixed mill feed, rye feed, rye bran, wheat, oat, and rye middlings, barley shorts, buckwheat feed, buckwheat hulls, ground corn and oats, corn, oats and barley, dried brewers' grains, malt sprouts, alfalfa meal, mixed feeds, dent corn, sweet corn, corn cobs, ground oat hulls, crushed oats, wheat screenings, pigeon grass seed, flax screenings, salvage barley, salvage grain, cull beans, pea feed, pea hulls, corn silage, green corn, green oats and peas, sorghum refuse silage, alfalfa hay, clover hay, western prairie hay, and brush feed.

Licensed commercial feeding stuffs, 1912, F. W. WOLL (*Wisconsin Sta. Circ. Inform. 31, pp. 13*).—A list of licensed manufacturers of concentrated commercial feeding stuffs for the calendar year ending December 31, 1912.

Results of the examination of stock feeds, B. L. PURCELL (*Ann. Rpt. Dairy and Food Comr. Va., 3 (1910–11), pp. 126–146*).—Analyses are reported of bran, ship stuff, hominy feed, corn-oil meal, corn meal, cracked corn, gluten feed, cotton-seed meal, oil meal, rye middlings, rye feed, shorts, wheat middlings, red dog flour, and mixed feeds.

Kansas feeding stuffs law, E. H. WEBSTER (*Kansas Sta. Circ. 18, pp. 7*).—This contains the text of the Kansas feeding stuffs law as revised in 1911, and an explanation of the law and the changes made in it.

The world's greatest meat market (*Breeder's Gaz., 61 (1912), No. 12, pp. 705, 706, figs. 2*).—This article describes the methods of marketing at the Smithfield market, London, and discusses the dressed meat trade of Great Britain.

"Approximately a fifth of the meat sold at Smithfield is domestic product." "Occasionally a little American mutton dribbles into Smithfield, but like American beef it promptly loses its identity." "Pork is displayed in enormous quantities in Smithfield, but it is mainly a showing of pigs, Danish and Holland contributions predominating." "Despite the growing paucity of American product displayed at Smithfield, the big Chicago slaughterers are conspicuously in the trade. One hears much of American control, but the proportion of the market business transacted by others is overwhelmingly large."

Miscellaneous information concerning the live-stock industry, J. ROBERTS (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910, pp. 499–524*).—This information includes a review of the live-stock market in 1910, meat prices at home and abroad, foreign trade in animals and animal products, legal standards for dairy produce, contagious diseases of animals in foreign countries, and a list of state live-stock sanitary officials.

The live-stock industry of Honduras, W. THOMPSON and J. E. DOWNING (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910, pp. 285–295, pls. 4, fig. 1*).—A popular account of information obtained by representatives of this Department, who made a tour of Honduras in order to obtain information to enable the Department to determine whether or not the importation of cattle from Honduras could be permitted under the law which prohibits the importation of live stock which are diseased, or have been exposed to infectious diseases within 60 days before the exportation.

The country is considered a good stock country as a whole, but the stock kept is poor and the methods are primitive. Three-fourths of the cattle in the country are raised in the departments of Choluteca and Olancho. Although some improved breeds have been imported, the greater part of the cattle are descendants of original stock imported from Spain and resemble the old Texas cattle. Bananas have been found to be a cheap and satisfactory food for fattening. The chief drawbacks are the lack of established markets in the provinces, the tick, and transportation facilities.

It was concluded that as southern fever and the cattle tick are prevalent throughout Honduras the importation of cattle to the United States could not be permitted.

Live-stock breeding in Uruguay, O. GUTH (*Rev. Asoc. Rural Uruguay, 40 (1911), No. 9, pp. 668–679; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 1, pp. 206, 207*).—A general account of the cattle and sheep industry.

Circuit breeding (*Amer. Breeders Mag., 3 (1912), No. 1, pp. 57–62*).—An editorial which discusses the method of organizing breeding circuits, and the results which have been obtained where they have been formed.

The principles of breeding and the origin of domesticated breeds of animals, J. C. EWART (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910, pp. 125–186, pls. 7, figs. 7*).—This comprises lectures given at the Fourth Graduate School of Agriculture, 1910.

Under the principles of breeding the author discusses such problems as line breeding, inbreeding, cross fertilization, reversion, effect of environment, maternal impression, telegony, transmission of acquired characters, Galton's ancestral law, and Mendel's law.

As an illustration of crossing distinct types the author reports an experiment in crossing a Mexican dog of the Chihuahua breed and a West Highland terrier. Another experiment is cited to show how a loss of vitality resulted by inbreeding goats. Other experiments, and the author's views on the origin of domesticated cattle, horses, and sheep, have been previously noted from other sources. It is pointed out that a knowledge of the history of the origin and characters of the breeds of domestic animals is a great advantage to those who undertake breeding experiments.

In conclusion the author states that, in order to improve breeding stock, "breed the best to the best, but avoid crossing different strains and different types of the same strain, and, as a rule, avoid close affinities."

The ancestry of domesticated cattle, E. W. MORSE (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910, pp. 187–239, pls. 3, figs. 8*).—This article includes lectures given at the Fourth Graduate School of Agriculture, 1910, and is a summary of the literature on this subject. There are brief historical sketches of the Bovidæ, the genus Bos, and the cattle bred by the early inhabitants of Asia, Northern Africa, and Europe. There is a critical discussion of different extinct species which may be the possible ancestors of the domesticated breeds in Europe and America. The classifications of breeds proposed by the different authorities are given, and a bibliography is appended.

[Cattle in Jamaica], H. H. COUSINS ET AL. (*Bul. Dept. Agr. Jamaica, n. ser., 2 (1912), No. 5, pp. 27–49, pls. 13*).—An account of the introduction and present status of the zebus, Red Polls, Jerseys, and grade Guernseys and Jerseys which have been imported to the island of Jamaica.

Brazilian Caracú cattle, N. ATHANASSOF (*Estudo sobre o gado Caracú. São Paulo: Govt., 1910, pp. IV+155, pls. 15, figs. 95; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 6, pp. 1405, 1406*).—An account of the characteristics of different breeds of cattle in São Paulo. Methods of management, body measurements, and statistical data are given.

Cattle breeding in Latium, A. STAZI (*Bol. Quind. Soc. Agr. Ital., 16 (1911), No. 23, pp. 901–911; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 2, pp. 474–476*).—This contains information on the state of cattle breeding, meat prices, and slaughter weights.

Experimental studies on cattle and pigs carried out at the Royal Zootechnical Institute of Reggio Emilia, A. ROMOLOTTI (*Studi Sperimentali Compiuti sui Bovini e Suini al R. Instituto Zootecnico di Reggio Emilia. Reggio Emilia, 1911, pp. 1–30; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 2, pp. 471–474*).—These studies report data on the increase in weight of cows during 9 months of gestation, the weight of the fetus at birth in relation to the live weight of the mother, the birth weight of Simmental-Reggiano calves, the weight of Simmental and Swiss calves at 1 year, the state of the teeth in calves at birth, and related topics.

Studies of the nutrition of the pig, E. V. MCCOLLUM and H. STEENBOCK (*Wisconsin Sta. Research Bul. 21, pp. 53–86, figs. 5*).—This bulletin consists of

3 articles, namely, Notes on the Creatinin Excretion of the Pig; Nature of the Repair Processes of Protein Metabolism; and A Metabolism Cage for the Pig. The first 2 articles have been previously noted from other sources (E. S. R., 26, pp. 359, 364). In the third article the advantages of using the pig for metabolism experiments are pointed out, and the details for constructing a metabolism cage for pigs are given.

The production of "hothouse" lambs, E. S. SAVAGE and G. W. TAILBY, Jr. (*New York Cornell Sta. Bul. 309, pp. 231–255, pl. 1, figs. 14*).—This presents the results of 8 seasons' experience in the production of "hothouse" lambs. Part 1 deals with the care, management, and methods of slaughtering as practiced at the station. Part 2 contains records of the flock and products obtained. Part 3 contains tabulated data on market quotations, birth weights, slaughter weights, gains made, cost of gains, and selling prices for each breed. Some of the results are summarized in the following table:

Data on production of hothouse lambs.

Breed.	Number of lambs.	Average birth weight.	Average gain.	Average gain per day.	Average selling price.
		Pounds.	*Pounds.*	*Pounds.*	
Dorset	46	9.3	39.6	0.54	$8.06
Grade Dorset	14	9.4	39.0	.55	9.07
Hampshire	4	9.7	37.8	.61	6.88
Cotswold	9	10.5	37.9	.61	6.55
Rambouillet	30	9.8	37.3	.52	7.73
Cheviot	23	8.3	37.5	.49	6.49
Grade Cheviot	16	9.8	38.1	.59	8.22
Delaine	30	10.0	36.6	.47	7.73
Southdown	19	9.7	38.5	.53	7.36
Grade Southdown	26	9.3	39.0	.49	6.90
Shropshire	13	10.0	37.5	.57	7.42
Grade Shropshire	31	9.1	37.2	.50	7.03

Evolution of the standard bred, F. R. MARSHALL (*Amer. Breeders Mag., 3 (1912), No. 1, pp. 45–51*).—This article consists of historical notes, which illustrate the rôle of selection in the improvement of breeds. The author is of the opinion that speed is probably the result of many contributing factors which, when analyzed, may prove to be unit characters inherited in Mendelian fashion.

Great sires of a hundred years, W. GILBEY (*Live Stock Jour. Almanac [London], 1912, pp. 46–56, figs. 8*).—Brief notes on famous sires of the different breeds of horses and ponies which originated in Great Britain are presented.

The army remount problem, G. M. ROMMEL (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910, pp. 103–124, pls. 5; Circ. 186, pp. 103–124, pls. 5*).—It is pointed out that although the mounted service of the U. S. Army is now being furnished in a fairly satisfactory manner with horses purchased and developed under the remount system, the price of remounts is high. The plan devised by this Department and the War Department, previously noted (E. S. R., 25, p. 374), to encourage the breeding of horses is deemed necessary, because horses of the proper type are not sufficiently numerous to supply the army in case of war, and the time may soon come when it will be difficult to supply those needed in time of peace.

Previous to the Civil War most of the horses bred in the United States were of the light type, but in the last 40 years the heavy draft horse has been bred for farm use. Although the number of horses has increased, the proportion suitable for remounts has appreciably decreased.

There is a brief account of the mounted service in the militia and of police in large cities. Specifications for saddle horses purchased in 1910 for the use of the New York mounted police, a brief account of the horse breeding work of this Department, and an outline of the plan for encouraging the breeding of horses for the army, are also given.

The restricted climatic environment of horses, C. E. WOODRUFF (*Jour. U. S. Cavalry Assoc., 22 (1912), No. 90, pp. 1086–1103*).—The significance of size, immunity to disease, coat color, and skin pigments in adapting horses to different climates is discussed. It is stated that a military horse fit for campaigning in all climates can not be bred, as he must be able to live in the open with little or no shelter.

Watering the heated horse, W. P. HILL (*Jour. U. S. Cavalry Assoc., 22 (1912), No. 90, pp. 1017–1020*).—It is maintained that it is a fallacy to believe that it is harmful for a heated horse to drink water, as large amounts may be drunk if the temperature of the water is not cold enough to chill the horse.

Pigeon culture as an agricultural industry, V. P. GONCHAROV (*Ezheg. Dept. Zeml. [Russia], 1910, pp. 452–544, pls. 10, figs. 13*).—The author describes the different varieties of pigeons, and discusses breeding, housing, feeding, and marketing. A bibliography of Russian and other publications, including periodicals devoted to pigeon culture, is appended.

Domestication of the fox, B. I. RAYNER and J. W. JONES (*Amer. Breeders Mag., 3 (1912), No. 1, pp. 37–45, figs. 3*).—An account of the silver fox industry in Prince Edward Island, where there are at present about 80 ranches stocked with about 200 fine dark silvers, 300 silver-grays, and 400 light silvers, the total skin value amounting to about $550,000, and breeding stock estimated at about $1,500,000 at current prices. The methods of feeding, management, and sale of furs are discussed.

Biological investigations on pregnancy, E. ABDERHALDEN and M. KIUTSI (*Hoppe-Seyler's Ztschr. Physiol. Chem., 77 (1912), No. 4, pp. 249–258*).—A preliminary note on experiments in the use of biochemical methods for diagnosing pregnancy in horses, rabbits, and guinea pigs.

The experimental production of the maternal placenta and the function of the corpus luteum, L. LOEB (*Jour. Amer. Med. Assoc., 53 (1909), No. 18, pp. 1471–1474; Med. Rec. [N. Y.], 77 (1910), No. 26, pp. 1083–1087; Zentbl. Physiol., 24 (1910), No. 6, pp. 203–208; Proc. Soc. Expt. Biol. and Med., 7 (1910), No. 4, pp. 90, 91; Deut. Med. Wchnschr., 37 (1911), No. 1, pp. 17–21; Arch. Entwickl. Mech. Organ., 31 (1911), pt. 3, pp. 456–478, figs. 2; Zentbl. Physiol., 25 (1911), No. 9, pp. 336–343*).—A series of studies on ovulation and related topics. The maternal placenta could be produced artificially in guinea pigs by the introduction of foreign bodies. The function of the corpus luteum was thought to be that of synthesizing the uterine mucosa and to prevent ovulation in pregnant animals. Also, by delaying the rupture of the follicle even in nonpregnant animals the sexual period is prolonged.

The size of the cell as a factor in form and function of domesticated animals, K. VON DER MALSBURG (*Arb. Deut. Gesell. Züchtungsk., 1911, No. 10, pp. 367, pls. 27*).—Following a discussion of some biochemical, physical, and morphological characters of cells, the author gives the average measurements of the diameter of striated muscle fibers of horses, cattle, and sheep.

In his opinion there is a correlation between the size of the muscle cells and the different species, breeds, and types of live stock, although this is influenced more or less by food, climate, and other ecological factors. He, therefore, suggests the use of these average measurements as "histo-biological symbols" for the different types and breeds of stock.

The false rib, A. BORGEAUD (*Terre Vaud., 3 (1911), No. 50, pp. 455, 456; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 2, pp. 458, 459*).—A critical discussion of the views of Bièler and Pagès, who consider that an abnormal number of floating ribs is a sign of a good dairy cow, but a fault to be avoided in draft and meat animals.

Notes on heredity, W. J. SPILLMAN (*Amer. Nat., 45 (1911), No. 536, pp. 507–512; 46 (1912), Nos. 542, pp. 110–120; 543, pp. 163–165; 545, pp. 309–312*).—The author reviews the recent work of Doncaster, Morgan, Loeb, Gortner, and others who have reported investigations on inheritance in plants and animals, as previously noted.

The general trend of the problems of development and inheritance, A. GREIL (*Zool. Jahrb., Abt. Allg. Zool., 31 (1912), No. 3, pp. 303–518*).—A discussion of the problems connected with embryology or the development of the individual, and inheritance or the development of the race.

Darwinism and human life, J. A. THOMSON (*London, 1911, pp. XII+251, pl. 1*).—This book contains a series of lectures, given before the South African Association for the Advancement of Science in 1909, and which treat principally of the factors concerned in variation and heredity. A bibliography of books on heredity, variation, and evolution is appended.

The value of pedigree, J. WILSON (*Live Stock Jour. Almanac [London], 1912, pp. 104–106*).—The value of knowing the pedigrees of breeding animals is pointed out, although a long pedigree is no guaranty that invariably the offspring will possess the qualities of near or remote ancestors. Though not so stated, the applications of Mendel's law in breeding horses and cattle are illustrated by a number of examples, and formulated into general principles as follows:

"We now know that most characters that make stock what they are run in pairs, a masking and a masked character." "It is easy to eliminate a masking character, but difficult to breed it pure, and it is difficult to eliminate a masked character, but easy to breed it pure."

A new method of proving Delbœuf's law, H. HUGUET and A. LHOSTE (*Rev. Vét. [Toulouse], 36 (1911), No. 10, pp. 605–614; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 1, pp. 202–204, pl. 1*).—A new method of proving mathematically that however large may be the number of individuals similar to itself, and however small the number of individuals different from itself, from which an isolated organism may arise, the time will arrive when the descendants that have varied will outnumber those that have not varied, providing the different generations breed in the same manner.

On the general theory of the influence of selection on correlation and variation, K. PEARSON (*Biometrika, 8 (1912), No. 3–4, pp. 437–443*).—This is a mathematical proof that certain formulas used by the author do not depend for their accuracy on the frequency being Gaussian in character.

"They are really peculiar to the general idea of the manifold linear variate u which gives the maximum correlation coefficient of an $(n+1)$th variate with n other variates. They do not involve any idea of continuity or any hypothesis as to the nature of the selected means, standard deviations, and correlations beyond the fundamental assumption that the selected population really exists inside the unselected population."

The application of the correlation coefficient to Mendelian distributions, E. C. SNOW (*Biometrika, 8 (1912), No. 3–4, pp. 420–424*).—Several criticisms are made of methods previously noted (E. S. R., 24, p. 374), and a demonstration of one is given to show that the method of finding correlation must be deter-

mined in each case according to the nature of the distributions dealt with, whereas some have applied all methods to all cases indiscriminately.

Supplementary tables for finding the correlation coefficient from tetrachoric groupings, P. F. EVERITT (*Biometrika, 8 (1912), No. 3–4, pp. 385–395*).—These tables were prepared to facilitate the determination of a correlation coefficient by the method of the fourfold table in those cases where correlation has a very high value.

DAIRY FARMING—DAIRYING.

Dairying, K. STÖREN (*Meierilære. Christiania [1911], pp. 282, figs. 118; rev. in N. Y. Produce Rev. and Amer. Cream., 32 (1911), No. 13, p. 482*).—A general treatise on dairying.

New queen of the dairy world, O. ERF (*Hoard's Dairyman, 43 (1912), No. 14, p. 543, figs. 3*).—An account of methods of feeding and other data concerning the Holstein cow, Banostine Belle De Kol, which is reported to have produced 27,404.4 lbs. of milk in 1 year.

Milking with machines, F. SCHNEITER (*Wiener Landw. Ztg., 62 (1912), No. 27, pp. 339, 340, fig. 1*).—A brief description of different types of milking machines, with a discussion of their practicability for the dairy farmer.

A short method of computing dairy rations according to the net energy standards, H. E. VAN NORMAN (*Pennsylvania Sta. Bul. 114, pp. 3–20*).—This bulletin presents a short method of computing dairy rations according to the net energy standards. The ordinary methods of computing balanced rations take into consideration their composition only, while with the energy standard the rations are computed according to their ability to do work as measured by energy after deducting the losses in feces, gas, urine, and energy of digestion. This leaves the net energy available for maintenance and milk production.

Samples of rations, a convenience table for compounding grain mixtures, and a table of energy values of the more common feeding stuffs are given.

On the specific effect of feeding stuffs upon milk production, A. MORGEN (*Landw. Vers. Stat., 77 (1912), No. 1–2, pp. 17–31*).—A brief report on an experiment with 3 sheep and 2 goats, with a review of previous work. All of these indicate that certain feeding stuffs exert a specific effect upon the yield of milk and the character of the milk fat.

The influence of organic and inorganic phosphorus compounds on milk secretion, G. FINGERLING (*Biochem. Ztschr., 39 (1912), No. 3–4, pp. 239–269*).—Rations containing straw, blood albumin, molasses, peanut oil, starch, salt, and carbonate of lime were used in these experiments with 2 goats.

Neither organic nor inorganic phosphorus in the form of lecithin, phytin, casein, nuclein, nucleic acid, and disodium phosphates were found to have any specific effect upon the activity of the mammary glands as regards the amount of milk, percentage of milk constituents, or absolute percentage of lime or phosphorus content of the ash. The organic phosphorus produced no better results than the inorganic phosphorus, so that apparently animals can obtain their supply of phosphorus through inorganic as well as organic compounds.

Hypoplasia mammaria and the chemical composition of milk, V. SELAN (*R. Lab. Chim. Agr. Udine, Ric. Sper. e Attiv. Spiegata, 3 (1909–10), pp. 33–38*).—No appreciable difference was found in the chemical composition of milk in the diseased and normal quarters of 2 cows affected with congenital hypoplasia mammaria.

The effect of the presence of Bacillus bulgaricus and of Bacterium lactis acidi upon typhoid bacillus in milk, LENA R. POTTER (*Rpt. Bd. Health Conn., 1909–10, pp. 150–154*).—Samples of sterile milk were inoculated with bouillon

cultures of the typhoid germs, and at the same time with either a culture of *B. bulgaricus* or *B. lactis acidi*, which had been recently isolated from sour milk.

As a result of the work it is concluded that the repressing influence of both the ordinary lactic organism and the organism of Metchnikoff upon the growth of typhoid bacilli in milk, if it occurs at all, is so slight as to be of no significance, and these organisms can not be depended upon for rendering safe milk which has been inoculated with typhoid fever germs.

The selective action of media on organisms of the coli group, and its bearing on the question of variation in general, C. Revis (*Centbl. Bakt. [etc.], 2. Abt., 33 (1912), No. 17–19, pp. 407–428*).—These experiments were made with milk in all cases except one. Ordinary milk was taken about 12 hours after milking and kept for 18 or 24 hours at a temperature of 20° C. and then examined, or else the milk was immediately examined and then kept for the necessary time and re-examined. One experiment was carried out with cow dung freshly excreted, and with a water dilution of it kept for 1 week at 20°. In all cases dilutions by tens were made down to 1:10°. One cc. of each after careful mixing was inoculated into tubes of bile salt glucose peptone water, and incubated for 18 to 24 hours at 37.5° anaerobically.

The results showed that the most numerous form is an organism coagulating milk and attacking lactose, saccharose, and adonitol vigorously. The other organism isolated on the same plate was evidently of the same variety, but much weaker in activity as the full fermentative power was not developed before 72 hours, whereas the other had exhibited its full effect in 24 hours. The results of the different forms are given, followed by a discussion of variation.

The following conclusions are drawn: "The types of coli-form organisms which appear on inoculation of dilutions of milk, etc., into bile salt glucose tubes are the result of a combination of mutual toxic action, acid development, and the nature of the medium. There is undoubted suppression of feeble organisms, particularly of those which can only produce acid and not gas from glucose.

"The aspect which at present obtains of the varieties of 'coli-form' organisms is an aspect determined by our media and its concomitants. Atypical forms of 'coli' are not degenerate forms, but stages in the variation of organisms belonging to the 'coli-typhoid' group."

A study of thirty-five strains of streptococci isolated from samples of milk, G. F. Ruediger (*Amer. Jour. Pub. Health, 2 (1912), No. 2, pp. 107–109*).—The cultural and morphological characters of streptococci isolated from fresh milk are presented in tabular form, and the following conclusions are drawn:

"*Streptococcus lacticus* can be differentiated from *S. pyogenes* by means of blood agar plates. The latter produces small colonies surrounded by a large zone of hemolysis, whereas the former produces green or greenish colonies with little or no hemolysis. *S. lacticus* has no sanitary significance as it is found in nearly all samples of clean, soured and fresh milk, and very often in the healthy milk ducts. *S. pyogenes* seems to occur but rarely in milk and is indicative of the existence of an inflamed condition of the udder of the cow. It seems likely, however, that these organisms may persist for some time after the inflammation has subsided, and that they may occur in mild inflammatory conditions."

An epidemic of septic sore throat in Baltimore and its relation to a milk supply, L. P. Hamburger (*Jour. Amer. Med. Assoc., 58 (1912), No. 15, pp.*

1109–1111).—A preliminary report of an outbreak of throat affection, in which children were more frequently attacked and suffered more seriously than adults. The trouble was due to a streptococcus which contaminated the milk supply in a certain dairy during a brief period when a pasteurizer was disabled and unpasteurized milk was delivered.

Tests of the efficiency of pasteurization of milk under practical conditions, E. H. SCHORER and M. J. ROSENAU (*Jour. Med. Research, 26 (1912), No. 1, pp. 127–158, fig. 1*).—A study of the effectiveness of pasteurization by the holding process.

It was found difficult to regulate the temperature, and the milk was not heated uniformly until it had been running at least 7 minutes. There was more or less variation between the different layers of the milk, and it is also stated that the thermometer does not register the maximum or minimum temperature of parts of the milk that may pass.

Attempts were made to determine the efficiency of the apparatus in destroying pathogenic organisims, and the authors are confident that if milk reaches 140° F. and is held there for 20 minutes, tubercle, typhoid, and diphtheria bacilli will be killed, but a liberal factor for safety is required. Therefore, the best temperature to meet practical conditions is about 145°, and the milk should be held at this temperature for from 30 to 45 minutes. The single holding tank was not found as trustworthy as 2, 3, or 4 in series. The first tank acts as an equalizer, while the remaining tanks hold the milk at a uniform temperature. The necessity for official control of all pasteurizing plants is emphasized.

The pasteurization of milk, S. H. AYERS (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 184, pp. 44, figs. 32*).—The information in this circular is compiled especially for dairy farmers and milk dealers. The topics discussed are the value of pasteurization, construction and arrangement of pasteurizing plants and machinery, care of machinery, controlling the process of pasteurization, handling and delivering pasteurized milk, and the cleaning of bottles and cans. The principal part of the work consists in the detailed description of different types of pasteurizers, holding tanks, retarders, and coolers. Comparative methods of the holding and flash process of pasteurizing are also discussed.

It is thought that pasteurizing in sealed bottles may become more popular in the future, the principal hindrance being the expensive equipment which is necessary, but it is believed that bottling milk while hot will make it possible to achieve practically the same results.

Some legal and practical aspects of a "bottled milk" regulation, J. O. JORDAN (*Amer. Jour. Pub. Health, 2 (1912), No. 2, pp. 105, 106*).—These are comments on the nullification by the supreme court of Massachusetts of the regulation of the Boston Board of Health, which prohibited the sale of milk or cream except in tightly closed or capped bottles or receptacles.

"This regulation went into effect on June 15, 1910, and had the endorsement of practically the entire community. Its enforcement had been carried on with such success that at the time of the above decision only 0.62 per cent of the daily supply was being sold in shops contrary to the provisions of the regulation. Furthermore, although the influence upon the public welfare from this change of handling can not be directly demonstrated, the facts obtainable indicate a decided improvement in the quality of shop milk from both chemical and bacteriological standpoints. Thus there were 27.8 per cent less court prosecutions based on low standard shop milk (i. e., deficiency in milk solids or fat) from June 15, 1910, to February 1, 1911, than for the corresponding period in 1909–10. Bacteriologically the gain is more remarkable, for despite the fact

that the regulation did not become operative until June 15, 1910, 77.8 per cent of the shop milk for the year 1910–11 complied with the board's regulation of 500,000 bacteria per cubic centimeter, while for the year 1909–10 only 54.74 per cent of the milk from stores conformed to this standard."

The permit system of cream buying, D. S. BURCH and W. F. DROGE (*Kansas Sta. Bul. 181, pp. 397–440, figs. 34*).—This bulletin, which has been prepared for persons engaged in receiving, sampling, and testing cream, gives a list of a cream-station equipment, methods of receiving and sampling cream, instructions for testing and paying for cream, milk, and skim milk, a discussion of cream-station difficulties, bacteria affecting milk and cream, and related problems.

The temperature of pasteurization for butter making, L. A. ROGERS, W. N. BERG, and B. J. DAVIS (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910, pp. 307–326, figs. 3; Circ. 189, pp. 307–326, figs. 3*).—The object of this investigation was to determine the proper temperature for pasteurization of cream for butter making as indicated by the destruction of bacteria and enzyms, and changes in flavor of the butter during storage. The pasteurizing was done in a continuous Jensen machine. The cream was cooled at once to churning temperature and churned within 3 hours.

From the results, presented in tabular form, it would seem that cream of a good quality can be efficiently pasteurized from the bacteriological standpoint by momentary heating to 71° C., but this is near the lower limit of safety, and if the bacterial content of the raw cream is high a temperature of from 74 to 77° C. must be used to secure uniform results. Peroxidase was destroyed at 77° and catalase and lipase at 70°. Galactase was much weakened by temperatures between 71 and 77°, but was not destroyed at 93°, the highest temperature employed.

An examination of the butter after storage indicated that pasteurizing at 66° or lower left in the cream some factor causing a deterioration of the butter which did not occur at 71° or higher. At 82° there was a cooked or scorched flavor to the butter, but this effect may be controlled to some extent by the skill of the butter maker. For the continuous pasteurization of sweet cream for butter making, therefore, a temperature of not lower than 74°, nor higher than 80°, is recommended, but it is stated that this applies to the pasteurizing of sweet cream in a continuous machine only. If cream is pasteurized in a vat or other holding device lower temperatures can probably be used.

Better butter for Kansas (*Kansas Sta. Circ. 21, pp. 4, figs. 2*).—This circular is written to show why cream is often of poor quality owing to bad management, and that good prices can be paid only for cream of superior quality.

Italian cheese-marking regulations, L. J. KEENA (*Daily Cons. and Trade Rpts. [U. S.], 15 (1912), No. 82, p. 93*).—This consists of extracts from the new Italian law relative to marking adulterated cheeses.

Increasing creamery profits by handling special products and utilizing by-products, S. C. THOMPSON (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910, pp. 297–306; Circ. 188, pp. 297–306.*).—This article contains practical suggestions to creamery operators for increasing their profits. The following topics are treated: The sale of sweet cream, manufacture of ice cream and casein, feeding of buttermilk to hogs, and handling eggs through the creamery.

The necessity for controlling the bacterial content of pharmaceutical lactic ferments, A. BERTHELOT and D. M. BERTRAND (*Ann. Falsif., 5 (1912), No. 42, pp. 164–171*).—Analyses of samples of commercial lactic ferments revealed the presence of undesirable types of bacteria, and it is urged that government control is necessary.

VETERINARY MEDICINE.

Book of veterinary doses, therapeutic terms, and prescription writing, P. A. FISH (*Ithaca, N. Y., 1912, 4. ed., rev. and enl., pp. 185*).—A fourth revised and enlarged edition of this pocket guide.

On the distribution of arsenic in the animal organism, SCHILLING and NAUMANN (*Arch. Schiffs u. Tropen Hyg., 16 (1912), No. 4, pp. 101–109; abs. in Sleeping Sickness Bur. [London] Bul., 4 (1912), No. 35, pp. 103, 104*).—In the investigations here reported arsenophenylglycin was administered to normal rabbits and to rabbits infected for a longer or shorter time with nagana. Each animal received a given dose and after a period of 24 or 48 hours was killed. The conclusions drawn are as follows:

"Twenty-four hours after intravenous injection the greater part of the arsenic is circulating in the blood. An infected rabbit excreted less arsenic than a non-infected rabbit. The blood serum contains considerably more arsenic than the blood clot. It is to be assumed that the blood cells of the circulating blood do not withdraw from the plasma any appreciable quantity of arsenic.

"The arsenic content of the organs varies apparently in an irregular manner. Absolutely, as well as relatively, the quantity of arsenic found is least in the brain and spinal marrow. Of the abdominal organs the kidneys contain relatively the most and the liver the smallest quantity of arsenic (5 out of 6 cases).

"If one takes into account the blood contained in the organs, by subtracting the arsenic contents of this from the arsenic found in the organs one gets the following results: The splenic cells always contain relatively large quantities of arsenic. Then follow the kidney cells. The arsenic content of the liver cells fluctuates within wide limits; it is always under that of the spleen and kidneys. The cells of the brain and spinal cord are free from arsenic."

Stock poisoning by larkspur, C. D. MARSH (*Proc. Amer. Nat. Live Stock Assoc., 15 (1911), pp. 69–77*).—In the author's investigations it was found that cattle were never poisoned when they ate less than 30 lbs. of larkspur per 1,000 lbs. weight of the animal. An equal quantity of either the tall or low larkspur was required to produce the toxic effect. Cattle on the range were rarely poisoned by tall larkspur after the first week in July, whereas the low larkspur was poisonous from the time it starts in the spring until the flowers drop from it the first of July, it being a little more poisonous about July 1 than at any other time, due to the fact that the seeds are somewhat more poisonous than the other parts of the plant above ground. In experiments with horses it was found possible to get them to feed on larkspur, although on the open ranges they never eat it in any large quantity. It is stated that sheep feed on larkspur very readily and actually grow fat upon it, without the slightest harm.

It was found with experimental animals that where remedies were not applied about half of the affected animals recovered. It is stated that a remedy which results in the recovery of about 96 per cent of the affected animals has been found, a description of which will be published in a forthcoming report.

The regional lymph glands of food-producing animals, J. S. BUCKLEY and T. CASTOR (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910, pp. 371–400, pls. 8, figs. 12; Circ. 192, pp. 371–400, pls. 3, figs. 12*).—This paper deals with the topographical anatomy of the lymphatic apparatus of food-producing animals.

"It is regrettable that a more absolute knowledge does not exist of the anatomical detail of this system in the various food animals, but an endeavor has been made to supply as much as possible of the general knowledge that could be gleaned from the various works that treat of this subject, together with a fair amount of original investigation carried out by the writers of this paper."

The bactericidal substances of leucocytes.—Their mode of action, W. SPÄT (*Centbl. Bakt. [etc.], 1. Abt., Orig., 59 (1911), No. 2, pp. 178–182*).—As a result of this work it is pointed out that the bactericidal property of leucocytes is not a complex process such as occurs with sera. If leucocyte extracts are heated to inactivity and a portion of unheated extract is added no reactivation takes place.

Filterable virus, G. VALLILLO (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 9 (1911), No. 6, pp. 433–479*).—This is a critical review of the literature pertaining to the diseases caused by, or at various times supposed to be caused by, filterable viruses. It embraces both the fields of veterinary and human medicine, and also contains a discussion of the mosaic disease of tobacco.

Pathogenic bacteriology, C. E. MARSHALL (*Michigan Sta. Rpt. 1911, pp. 155–170*).—This is a brief account of the occurrence and work of the year with contagious abortion, infectious anemia in horses at Watersmeet, a disease of cattle near Ubly, Huron County, malignant catarrh of cattle, granular vaginitis of cattle, avian tuberculosis, a disease of sheep in Clinton County, and worms in pigs. The tuberculin test proved inapplicable for chickens.

Annual report of the official veterinarians of Prussia for 1909, NEVERMANN (*Veröffentl. Jahres-Vet. Ber. Tierärzte Preuss., 10 (1909 [pub. 1911]), pt. 1, pp. VI+132, pls. 17; 10 (1909 [pub. 1912]), pt. 2, pp. IV+169*).—The first part of this report consists of statistical data, discussions, etc., on anthrax, symptomatic anthrax, rabies, glanders, inflammation of the brain and spinal cord in horses, foot-and-mouth disease, lung plague, dourine, vesicular eruption in horses and bovines, scabies in horses and sheep, swine erysipelas, swine plague, hog cholera, chicken cholera, fowl plague, equine influenza, and strangles in the horse.

The second part deals with diseases that the law does not require to be officially reported, poisoning, general disturbances of nutrition, sporadic diseases, meat inspection, statistics relating to farm animals, etc.

Epizootics in the German Empire (*Jahresber. Verbr. Tierseuch. Deut. Reiche, 25 (1910), pp. VII+200, pls. 4, figs. 20*).—This is a report in regard to the distribution of epizootics in the German Empire during the year 1910.

Combating dysentery in calves, shoats, lambs, and foals, the gastric form of canine distemper, and other infectious stomachical and intestinal diseases with Ventrase, M. KLIMMER (*Deut. Landw. Presse, 39 (1912), No. 1, pp. 1, 2; Berlin. Tierärztl. Wchnschr., 28 (1912), No. 1, pp. 1–7*).—Ventrase, which is a colloidal silver preparation containing in addition a protective colloid, is given to new-born calves and other animals with the milk. Comparing the results thus obtained with check animals which received no Ventrase, the results are considered good. In one of the articles the germicidal value of this preparation for the intestinal tract of dogs was also studied.

The protozoan parasites of domesticated animals, H. CRAWLEY (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910, pp. 465–498, pls. 6, figs. 13; Circ. 194, pp. 465–498, pls. 6, figs. 13*).—This is a popular account of the more common protozoan parasites of domesticated animals, including spirochetes, trypanosomes, coccidia, piroplasms, sarcocysts, etc.

Fasciolopsis buski in Tonkin.—Its extreme rarity in man; its frequency in the hog, C. MATHIS and M. LEGER (*Bul. Soc. Path. Exot., 4 (1911), No. 4, pp. 200–202; abs. in Jour. Trop. Vet. Sci., 7 (1912), No. 1, pp. 149, 150*).—Of 248 head of swine examined at the abattoir at Hanoi, December 9–27, 1910, 16 harbored this fluke. As many as 20 were found in one animal.

Our present knowledge of the distribution and importance of some parasitic diseases of sheep and cattle in the United States, M. C. HALL (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910, pp. 419–463, pls. 2, figs. 18; Circ. 193.*

pp. 419–463, pls. 2, figs. 18).—Following a brief discussion of the importance of parasitic diseases and the desirability of a study of distribution, etc., the author takes up the present knowledge of the distribution and importance of *Piroplasma bigeminum*, *Fasciola hepatica*, *F. magna*, *Multiceps multiceps*, *Thysanosoma actinioides*, *Hæmonchus contortus*, *Œsophagostomum columbianum*, *Œstrus ovis*, and *Psoroptes communis ovis*, respectively.

Maps illustrating the distribution of these parasites and a bibliography of 33 titles are included.

Cysticerci in American sheep, reindeer, and cattle, B. H. RANSOM (*Science, n. ser., 35 (1912), No. 903, p. 636*).—It is stated that the heart and voluntary muscles of sheep are frequently found by federal meat inspectors to be infested with cysticerci. While these cysticerci closely resemble *Cysticercus cellulosæ*, it is improbable that so many cases of this parasite would occur in sheep and be so comparatively rare in this country in hogs, which are the usual host.

Specimens of muscle cysticerci from Alaskan reindeer have been provisionally identified as the cysticerci of *Tænia krabbei*, a tapeworm of the dog. Mention is made of some unusually high percentages of infestation of cattle with *C. bovis*.

The determination of opsonins and bacterial tropins in antistreptococcic serum in horses, PRICOLO and BARTELLI (*Clin. Vet. [Milan], Rass. Pol. Sanit. e Ig., 34 (1911), Nos. 17, pp. 769–775; 18–19, pp. 817–826; abs. in Berlin. Tierärztl. Wchnschr., 28 (1912), No. 7, p. 127*).—Normal and immune sera were both found to contain substances capable of stimulating the phagocytosis of *Streptococcus equi*. In normal serum the substances are thermolabile, while in immune they are thermostabile. They are present in larger amounts in the immune sera.

The opsonic index was found to fluctuate only between very narrow limits. It was greater in immune animals, but on injection of virulent organisms it was found to assume a negative phase. Accordingly, it is concluded that opsonins and bacterial tropins are different substances.

In regard to the preparation of a precipitating anthrax serum, W. N. MARKOFF (*Berlin. Tierärztl. Wchnschr., 27 (1911), No. 47, pp. 849–851*).—By injecting rabbits with bacteria-free extracts of the anthrax bacillus it is possible to obtain a specific precipitating serum. The specific precipitating substances in the serum rise to a certain fastigium and then begin to vanish gradually. Physiological salt solution (0.85 per cent) is not recommended for preparing the antigen, as it produces a ring in the test with the specific serum itself. Bouillon can be used to better advantage.

Treatment of anthrax by hypodermic injections of carbolic acid, G. CONDER (*Jour. Trop. Vet. Sci., 6 (1911), No. 4, pp. 436–441*).—In this article are recorded the results of treating 11 horses affected with anthrax by injections of carbolic acid. These were given every 2 to 4 hours at the beginning of the disease, and later every 6 hours until the temperature reached normal.

Seven of the cases recovered, and of the 4 animals which died 3 did not receive the treatment in the early stages of the disease. Two other animals which received no treatment died.

The significance of agglutination for diagnosing blackleg and the fermenting capacity of the Bacillus anthracis symptomatici, with particular regard to differentiating between symptomatic anthrax and malignant edema, G. GROSSO (*Berlin. Tierärztl. Wchnschr., 27 (1911), No. 35, pp. 621–625*).—The results show that the highest fermenting capacity toward dextrose, lactose, saccharose, and glycerin was possessed by the *B. anthracis symptomatici*. The pseudo blackleg bacteria also fermented saccharose but not glycerin. The bacillus of malignant edema in a few instances decomposed glycerin,

but did not ferment saccharose. The *B. anthracis symptomatici* can be sharply distinguished from the edema bacillus on the basis of the fermentation test.

Various methods for the diagnosis of glanders, J. R. Mohler and A. Eichhorn (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910, pp. 345–370, pls. 4; Circ. 191, pp. 345–370, pls. 4*).—After discussing the nature of glanders, particularly occult glanders, the authors give a description of practically all the tests thus far proposed for its diagnosis. The tests considered are physical examination, post-mortem examination, the auto-inoculation method, extirpation of the submaxillary gland, mallein reaction (subcutaneous), the ophthalmo test, cutaneous tests, the agglutination reaction, precipitation reaction, complement fixation test, and the combined complement fixation and agglutination tests. In all instances the methods of conducting the tests, the interpretation of the reactions, and their reliability are considered.

On the sero-diagnosis of glanders, K. F. Meyer (*Rpt. Govt. Vet. Bact. Transvaal, 1909–10, pp. 156–169*).—Substantially noted previously (E. S. R., 25, p. 684).

The action of "606" upon glanders in laboratory animals, W. Benewolensky (*Abs. in Vet. Rec., 24 (1911), No. 1201, p. 39*).—Rabbits, guinea pigs, and cats were artificially infected with glanders by means of a 3 days' culture of bacilli in glycerin agar, and were afterwards treated with one or two injections of Salvarsan ("606"). The glanders bacilli were introduced intraperitoneally in the case of 11 guinea pigs and 15 rabbits, and into the back of the neck in 12 cats, with 6 rabbits, 4 cats, and 4 guinea pigs as controls. In animals that died, in addition to post-mortem observation, cultural experiments were made with the heart's blood and from the liver and spleen. The author also tested the action of Salvarsan upon glanders bacilli in vitro.

The results showed a very clearly evident influence of Salvarsan upon the glanderous processes. The duration of the diseased process stood in definite relationship to the quantity of Salvarsan injected, especially in the case of rabbits. Animals which received a quantity of Salvarsan approaching the dose tolerated by the species died quickly, while those which received no Salvarsan died in due course from the ordinary progression of the disease. Animals which had received a smaller dose of Salvarsan, on the other hand, lived. In acute glanderous processes it is possible to sterilize the infected organs by means of Salvarsan.

The treatment of tetanus, G. Baccelli (*Berlin. Klin. Wchnschr., 48 (1911), No. 23, pp. 1021–1024; abs. in Berlin Tierärztl. Wchnschr., 27 (1911), No. 35, p. 627*).—In galloping cases of tetanus heroic doses of antitetanin are without value, as they bring about a peracute condition.

Influence of tetanus toxin and tuberculin upon autolysis.—Behavior of the lipoids, G. Pesci (*Centbl. Bakt. [etc.], 1. Abt., Orig., 59 (1911), No. 2, pp. 186–188*).—The author sought to determine how the lipoids of autolysates of organs (sheep's liver taken after death) behave when brought into contact with tetanus toxin and tuberculin, with particular reference to the autolytic process. Controls were prepared of the autolysates containing no additions.

From the results it could be noted that a diminution in neutral fats and fatty acids and an increase in soaps took place in the case of the tetanus toxin, while in the tuberculin no appreciable changes could be observed.

The passage of tubercle bacilli through the intact skin, H. Koenigsfeld (*Centbl. Bakt. [etc.], 1. Abt., Orig., 60 (1911), No. 1–2, pp. 28–68, figs. 3*).—The results indicate that tubercle bacilli pass through the skin via the hair follicles from which the hair has been cut or shaved off or removed with a depilator. No difference seems to exist between the infection caused by either

the human or bovine type of bacillus. The skin in no instance showed any visible microscopic changes, and seems to be greatly resistant to the infection.

Tubercular septum in the nose of a bovine, P. CHAUSSÉ (*Rec. Méd. Vét., 88 (1911), No. 24, pp. 580–585, figs. 3*).—The results are given of a histopathological study of a case in which the nasal septum of an 8-year-old cow was affected. The animal had a generalized tuberculosis.

Improved technique for diagnostic inoculation of animals with tuberculous material, R. OPPENHEIMER (*München. Med. Wchnschr., 58 (1911), No. 41, pp. 2164–2166; abs. in Jour. Amer. Med. Assoc., 57 (1911), No. 21, p. 1731*).—The urine of the suspect was injected directly into the liver of guinea pigs. Specific lesions were found to develop in about 16 days.

The subcutaneous bovotuberculol test for the diagnosis of bovine tuberculosis, H. BAUSCH (*Die Subkutane Bovotuberkulolprobe für die Diagnose der Rindertuberkulose. Inaug. Diss., Univ. Bern, 9111, pp. 27; abs. in Ztschr. Tuberkulose, 18 (1912), No. 5, p. 509*).—As a result of examining 302 animals in an abattoir at Darmstadt, Germany, the author finds that the tuberculol test when used subcutaneously yields better results than those obtained with tuberculin. A previous eye test will have no influence upon a subsequent tuberculol reaction, but it must be conducted after the subcutaneous injection.

The vaccination of cattle against tuberculosis, E. C. SCHROEDER ET AL. (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910, pp. 327–343; Circ. 190, pp. 327–343*).—Previously noted from another source (E. S. R., 25, p. 288).

The medicamental treatment of piroplasmosis, E. MEULEMAN (*Rev. Gén. Méd. Vét., 19 (1912), No. 223, pp. 365–380*).—This is a review of recent work.

Vaccination against bovine piroplasmosis, J. LIGNIÈRES (*Rev. Gén. Méd. Vét., 18 (1911), No. 213, pp. 489–506; abs. in Jour. Compar. Path. and Ther., 25 (1912), No. 1, pp. 59–63*).—The author claims to have shown that animals which are very resistant to *Piroplasma bigeminum* may be very susceptible to a new piroplasm which he has named *P. argentinum* and that the latter may even prove fatal.

Blood taken from diseased cattle at a time when it contained a maximum number of parasites and kept at from 5° to 8° C. for 30 days, when injected intravenously, frequently caused a mild form of the disease, which was followed by immunity. The parasites present in this blood were found to be smaller than normal, spherical, and apparently multiplying. An intravenous injection of 10 cc. of this blood caused about the seventh day a general reaction which lasted for 1 or 2 days. This first vaccine retained its vitality for at least 8 days.

The methods of preparing the vaccine from blood containing the *P. bigeminum* by desiccation or freezing can not be applied to the *P. argentinum*, because this parasite retains both vitality and virulence after freezing. Since the introduction of the method 23,000 animals have been vaccinated.

Some results of cattle-tick eradication (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 196, pp. 4*).—This is a summary of the replies received in response to a series of questions sent out in an effort to secure direct evidence from cattlemen and farmers regarding the benefits to the cattle industry of the South which are being derived from the tick-eradication work carried on in cooperation between the Bureau of Animal Industry of this Department and the various States within the quarantined area.

The etiology of pleuro-pneumonia, E. J. MARTZINOVSKI (*Ann. Inst. Pasteur, 25 (1911), No. 12, pp. 914–917, pl. 1*).—The author here reports studies commenced in 1909 which have led him to conclude that pleuro-pneumonia is caused by a minute gram-negative, polymorphous, nonmotile bacterium, to which he gives the name *Coccobacillus mycoïdes peripneumoniæ*. A magnification of 1,000 diameters is necessary in order to distinguish it clearly.

Parturient paresis (milk fever) and eclampsia; and the internal secretion of the mammæ as a factor in the onset of labor (*Kentucky Sta. Bul. 160, pp. 83–104, pls. 9; Jour. Infect. Diseases, 10 (1912), No. 2, pp. 226–232, 233–243, 244–247, figs. 13*).—This bulletin consists of 3 papers.

Parturient paresis (milk fever), and eclampsia; similarities between these two diseases, D. J. Healy and J. H. Kastle (pp. 83–90).—In this first paper the symptoms of parturient paresis and eclampsia are discussed and the similarities between the 2 diseases pointed out. A normal clinical urinalysis, based upon 100 urinalyses of the dairy cow covering a period of 3 winter and 3 summer months, is described, together with the urinalyses of 3 cases of parturient paresis. Since none of the 3 cases observed during the year succumbed, the finer pathological changes occurring in parturient paresis have not been established.

The theories of the cause of the 2 diseases are next discussed. "That the disease is due to a toxin elaborated in the udder, as the result of its own metabolism preceding normal milk production, there can be no reasonable doubt, and that the success of the modern treatment is due to preventing, by means of pressure, the absorption of this toxin seems most highly probable.

"We are of the opinion that eclampsia is due to a similar toxin elaborated by the breast in a similar manner, and would strongly recommend, as the most promising treatment, dilatation of the breasts with oxygen or sterile air, accompanied by vigorous massage of the breasts, or forcible compression of them by means of a properly applied bandage, at the same time using whatever medical measures may be indicated."

The toxic character of the colostrum in parturient paresis, J. H. Kastle and D. J. Healy (pp. 91–100).—In this second paper the authors report tests made of the effect upon the guinea pig of injections of the first colostrum of cows suffering from parturient paresis, the first colostrum of the normal cow, fresh milk from the station herd, the urine of the normal cow and the first urine of a cow suffering from parturient paresis, normal salt solution (0.85 per cent NaCl), and the aqueous solution of certain residues from colostrum and milk left after precipitating the colostrum and milk with dilute acid, and evaporating, respectively.

"It is evident from these results that normal salt solution, fresh milk from normal cows, the colostrum of normal cows, and the urine of a healthy cow cause no serious disturbances in the normal guinea pig, when injected into the peritoneal cavity. The injection of the colostrum of normal cows invariably caused a diarrhea in healthy guinea pigs, male and female, from which they gradually recovered after a few days. . . .

"On the other hand, death resulted from the injection of the colostrum of the cow having parturient paresis, and the post-mortem and microscopical examinations of the organs of the 4 guinea pigs that were thus killed showed the same pathological degenerations and changes that are characteristic of eclampsia. Unfortunately, but little if anything seems to be known regarding the micropathology of parturient paresis in the cow. We have shown, however, that cows recovering from an attack of this disease invariably show a nephritis. Our results with the colostrum of the cow suffering with parturient paresis certainly go to show the presence therein of some substance toxic to guinea pigs and certainly point to the udder and the mammary glands as the place of origin of the toxins or internal secretions producing parturient paresis and eclampsia respectively. The fact that the urine of the cow with parturient paresis causes such a profound diuresis in the guinea pig also points to the presence of toxic substances in the urine of animals so affected, and indicates that these toxins are not entirely destroyed in the tissues of the cow, but are in part at least, and

it may be in somewhat modified form, excreted by the kidneys. The fact also that the colostrum of the cow during an attack of parturient paresis invariably caused an abortion in pregnant guinea pigs is a matter of considerable physiological significance and will be discussed more fully in the following paper."

The internal secretion of the mammæ as a factor in the onset of labor, D. J. Healy and J. H. Kastle (pp. 101–104).—In this third paper the authors report experiments in which they found that the colostrum of the normal cow, as well as of the cow suffering from parturient paresis, contains a substance or substances, capable of bringing about abortion in pregnant guinea pigs. "The substance or substances in the fresh colostrum of the normal cow which excite the pregnant guinea pig to premature labor, withstands heating to boiling for a short time. In this respect it is similar to the hormones and differs from the soluble ferments and many toxins."

An unusual cause of udder disease, L. A. Klein (*Amer. Vet. Rev., 41 (1912), No. 1, pp. 30–37*).—The author describes an affection in which the skin of the udder, especially about the base of the teats, was irritated, dry, stiff, scaly, and sometimes swollen or thickened, while the milk of affected animals contained small flakes and white jelly-like clumps. At the time the cows were first examined only a few animals were affected but the number gradually included 90 per cent of the cows of a large dairy herd, clumps and flakes being so numerous that the cotton strainer was clogged and the milk would not pass through. In many instances small scabs were present, indicating the previous existence of a crack or fissure, and in some cases small abrasions or excoriations were present. The condition resembled in all respects a mild acute or subacute inflammation of the skin. Of the 48 cows showing the milk changes or teat symptoms, indicating the presence of catarrhal mastitis, 30 also exhibited these alterations in the skin covering the base of the teat."

The author's investigations showed the disease to be due to the exposure of the wet udder to cold, it having been the practice to wash the croup, buttocks, flanks, the legs (inside and out, down to the claws), the tail, and the udder with a mild disinfectant solution. "The udder trouble began about the middle of November, just after cold weather had begun. There were more affected cows in the end of the stable where the doors were frequently opened and kept partly opened for ventilation than in the other end where they were almost constantly closed. The irritated condition of the skin observed on the udders was just at the point where fluids placed on a clipped udder would collect by gravitation, and which, therefore, would remain wet longest."

The application of excessive quantities of water in cleaning the cows was replaced by dry brushing, using water only when necessary, wiping the udder with a cloth dampened with a 2 per cent solution of sodium carbonate, and then anointing with a small amount of vaseline. This, together with the administration of 3 drams of bicarbonate of soda and 1½ drams each of sodium sulphate and potassium acetate upon the feed twice daily, resulted in the recovery of the animals.

Primary splenomegaly in sheep, L. E. Day (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910, pp. 415–418*).—Splenomegaly as a distinct pathological process was first described in 1882, but so far as the author has been able to determine, has not been reported in the lower animals. An examination, both macroscopic and microscopic, made of an enlarged spleen and the liver from a sheep, which were received for diagnosis from one of the large slaughtering establishments in Chicago, is here reported in detail. The changes in the tissue were so characteristic that a diagnosis was made of primary splenomegaly.

The preparation of hog cholera serum in Hungary, A. Eichhorn (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910, pp. 401–413, pls. 2, figs. 6*).—This is a

description of the apparatus and methods for preparing hog cholera serum in use at the government laboratory at Kobänya, a suburb of Budapest, Hungary. The process followed is essentially that devised by this Department, with certain modifications in details and apparatus. The table on which hogs are placed for bleeding, apparatus used in bleeding hogs, stall for securing hogs for inoculation with virus, stand for securing hogs for bleeding from the tail, apparatus for siphoning serum after centrifugalization of blood, and apparatus for filling the bottles with serum are described. The directions for the use of the serum are given, and the results obtained in its use, the selection of hogs for the production of serum, experiments with the simultaneous method of inoculation, the disposal of meat of hogs used in serum production, and price of serum, etc., are briefly discussed.

Some observations on the clinical symptoms, prophylaxis, and treatment of distemper, J. P. McGowan (*Vet. Jour., 68 (1912), No. 439, pp. 7–17*).—The author again describes an organism (E. S. R., 24, p. 787) which is "a gram-negative bacillus, and which shows, when stained by carbol thionin, polar staining or a constriction in the middle. Its length varies from 2.3 μ to 0.5 μ, and its breadth from 0.5 μ to 0.4 μ." Its size is particularly variable "when grown in glycerin agar, assuming an almost coccal form." It is only slightly motile, has flagella, and forms no spores. The growth on the surface of agar is very characteristic, showing at the end of 24 hours hardly visible dewdrops, which enlarge very rapidly during the next 24 hours and assume the size of pin-heads which are raised above the surface of the medium and have a porcellaneous appearance with some opalescence. The growth is more rapid on blood agar. The organism renders litmus milk alkaline and produces no gas in saccharine substances and related bodies. As regards pathogenicity, it produces "typical distemper with the rise of temperature with the nasal discharge, eye symptoms, and later 'chorea' and distemper rash. It was produced in one puppy by pouring a culture of the organism down its nose; in another pup a much milder form of the disease was produced." It was only lethal for mice.

The author divides distemper as follows: "(1) Uncomplicated distemper; (2) complicated distemper, [with] subgroups, viz, (a) complications due to spread of infection by the distemper organism to various parts, (b) complications due to added infections by organisms other than the distemper organism, (c) complications due to toxins, (d) complications due to causes other than above; (3) mixtures of the above groups."

These forms are discussed, together with the prophylactic and curative treatment of the disease.

Further studies on the Bacillus bronchicanis, the cause of canine distemper, N. S. Ferry (*Amer. Vet. Rev., 41 (1912), No. 1, pp. 77–79*).—Since the publication of the article previously noted (E. S. R., 24, p. 285), it has been found that the disease due to *B. bronchicanis* may be more widespread among animals than has been thought to be the case. In studies made during the course of an outbreak among laboratory animals, it was found that although the symptoms differ somewhat in various animals, yet the primary cause without a single exception was due to this organism.

"In nearly 100 per cent of the cases the *B. bronchicanis* was found at autopsy in pure culture in the lower trachea. In but a very few of the cases was there any sign of a nasal discharge or any abnormal condition of the eyes. The majority of the rabbits showed symptoms of distemper, commonly called, in the rabbit, 'snuffles,' while but 2 or 3 of the guinea pigs were thus affected, and

none of the monkeys. Only one of the animals, a monkey, had shown signs of a cough, which animals gave the *B. bronchicanis* pure in the trachea and blood."

Since the organism attacks other animals besides the dog, the author proposes to change the name to *Bacillus bronchisepticus*.

Contribution to the study of epizootic lymphangitis, M. L. Teppaz (*Jour. Trop. Vet. Sci., 7 (1912), No. 1, pp. 53–61*).—*Leucocytozoon piroplasmoides* was found in the pus of all the buds of 100 horses that were examined, to the exclusion of all other organisms.

An anatomo-pathological and experimental study of pernicious anemia (typho-anémie infectieuse) of the horse, G. Finzi (*Rev. Gén. Méd. Vét., 18 (1911), No. 216, pp. 681–687, figs. 2*).—The author reports studies made of the lesions found in the liver, kidneys, and spleen, together with studies of the blood.

A contribution to the study of infectious paraplegia of the horse, A. Moulun and A. M. Oyuela (*Bul. Soc. Cent. Méd. Vét., 89 (1912), No. 6, pp. 140–145*).—This paper consists of clinical and bacteriological notes made during an epidemic at Maizières, France, in November, 1911.

A report upon the permanent value of the roaring operation as evidenced by the present condition of 100 horses which have been satisfactorily operated upon for roaring from 18 months to 2½ years ago, F. Hobday (*Vet. Jour., 68 (1912), No. 442, pp. 207–218*).—The author, who has operated for roaring upon more than 520 individual horses, finds that the beneficial results obtained are lasting.

RURAL ENGINEERING.

On the measurement and division of water, L. G. Carpenter (*Colorado Sta. Bul. 150, pp. 3–48, figs. 5*).—This is a revision of Bulletin 27 of the station, previously noted (E. S. R., 6, p. 485), to which is added a set of tables showing the discharge over right-angled triangular weir notches, and a discussion of the use of rating flumes and of Kutter's formula for determining the flow in canals.

[Investigation of the regulation of hydraulic works in the United States of America], R. Tavernier (*Ann. Dir. Hydraul. et Amélior. Agr., Min. Agr. [France], 1909, No. 39, pp. 307–447*).—This report deals with the developments in the United States relative to laws regulating interior navigation, irrigation, water power, and the conservation of these natural resources. In connection with this report are a number of reports and articles on irrigation, hydraulics, hydroelectric works, and reclamation in various parts of the United States.

An experiment station for irrigation, M. Conti (*Agr. Colon. [Italy], 6 (1912), No. 1–2, pp. 29–37, figs. 6*).—This article deals with the need and importance of irrigation in Argentina, briefly discusses institutions for experimental agricultural hydraulics, and describes the irrigation experiment station conducted by the Faculty of Agronomy of the National School of Agriculture at Buenos Aires and its work.

Irrigation in Egypt, J. Barois (*Les Irrigations en Égypte. Paris, 1911. 2. ed., rev. and enl., pp. XVI+422, pls. 17, figs. 90*).—This publication deals with irrigation works and irrigation administration and legislation in Egypt, and discusses the topography and character of the soil, inundation, irrigation of the Delta and of middle Egypt, drainage of irrigated land, and construction and maintenance of dams and canals. A description is given of the inundation basins, of different irrigation works, and of agricultural developments in Egypt.

Irrigation and drainage, L. A. B. Wade (*Rpt. Dept. Pub. Works N. S. Wales, 1911, pp. 33–67*).—This report covers the operations and expenditures

of the irrigation and drainage branch of the department of public works of New South Wales in 1911, embodying the reports of the assistant engineers on sewerage construction, swamp drainage and water conservation, irrigation, artesian boring, and river discharge observations and records.

Proceedings of third annual drainage convention held at Wilmington, N. C., November 22, 23, 1910, J. H. PRATT (*N. C. Geol. and Econ. Survey, Econ. Paper 21, 1911, pp. 67, pls. 4*).—This paper gives the proceedings of the third annual drainage convention held in North Carolina in 1910, a copy of the North Carolina drainage law, North Carolina supreme court decisions regarding the validity of drainage bonds, and a paper on Tile Drainage by J. R. Haswell, of the Drainage Investigations of this Office.

Reclaiming land by drainage, H. R. MCVEIGH (*Manfrs. Rec., 61 (1912), No. 15, pp. 51–53, figs. 3*).—This article deals with the development of levee and drainage districts in the lower Mississippi Valley, and discusses several drainage projects in this locality intended to drain and make fit for cultivation some 2,300,000 acres of land.

[Drainage in land reclamation] (*Manfrs. Rec., 61 (1912), No. 11, pp. 49, 50, figs. 4*).—A drainage development work in Florida by which it is intended to reclaim a tract of 118,000 acres of land is described.

[A drainage plan in Louisiana], W. S. WHITE (*Rice Jour. and South. Farmer, 15 (1912), No. 5, p. 3, fig. 1*).—A description is given of a plan for draining an area of 41,000 acres of land in Louisiana. This work involves about 38 miles of ditch, requiring about 653,400 cu. yds. of excavation. Specifications for clearing and excavating are given.

Drainage, E. J. WATSON (*Ann. Rpt. Comr. Agr., Com. and Indus. S. C., 8 (1911), pp. 101–111, fig. 1*).—This report deals with the South Carolina drainage act, surveys and preliminary examinations of drainage projects in the State, the organization of the National Drainage Congress, and the South Carolina State Drainage Association, and the growth of irrigation developments in the State.

Cost and methods of clearing land in western Washington, H. THOMPSON (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 239, pp. 60, figs. 25*).—This bulletin represents cooperative studies with the Washington, Wisconsin, and Minnesota stations, and a portion of the work reported has been previously noted (E. S. R., 26, p. 787). It calls attention to the extent of waste stump land in western Washington and deals with the methods and costs of clearing this land for farming purposes and for general use, briefly discussing the methods for converting stump land into pasture and describing and discussing the methods and apparatus required for removing stumps by heavy blasting, by a stump puller with and without blasting, by a donkey engine, and by char-pitting and burning. Cost data are given for removing stumps of varying sizes under varying conditions by each of the above methods.

It is concluded that a man without capital can not hope to clear, in a short time, a large enough tract of land upon which to support a family. Under the most favorable conditions and with the lightest clearing ground, the cheapest rate at which logged-off land can be prepared for the plow is $50 per acre and the maximum is about $150 per acre. The method of clearing by donkey engine in connection with blasting, char-pitting, and burning seems to be the cheapest, most efficient, and most serviceable method, especially when the work is done on a large scale.

Highway engineering, A. H. BLANCHARD and H. B. DROWNE (*New York and London, 1911, 1. ed., pp. X+299*).—This volume gives a large mass of information relative to the construction and maintenance of roads and pavements, as presented at the Second International Road Congress, held at Brussels, 1910.

Science in the service of highway construction, C. RICHARDSON (*Pop. Sci. Mo., 80 (1912), No. 4, pp. 326–337, fig. 1*).—The author outlines the development of modern methods of highway construction and shows how science has aided therein.

Good roads, E. J. WATSON (*Ann. Rpt. Comr. Agr., Com. and Indus. S. C., 8 (1911), pp. 121–127, pls. 2, fig. 1*).—This report deals with the development of road construction, maintenance, and administration in South Carolina, and gives tabulated data on the total mileage of public roads in the State, the methods of construction and improvement, and the expenditures in money and labor.

Proceedings of the second annual convention of the Inter-Mountain Good Roads Association, Pocatello, Idaho, June 22–24, 1911 (*Proc. Inter-Mountain Good Roads Assoc., 2 (1911), pp. 64*).—These proceedings contain discussions of road construction, maintenance, and administration in general, and reports of road work done in the different States belonging to this association.

Report of the State Highway Commission of Minnesota, 1909–10 (*Rpt. Highway Com. Minn., 1909–10, pp. 31, figs. 11*).—This report presents general investigations of road conditions, building material, and construction and maintenance methods, and includes the state engineer's report on the roads of the State.

French experiments with tarred roads, W. H. HUNT (*Daily Cons. and Trade Rpts. [U. S.], 15 (1912), No. 103, p. 430*).—Attention is called to the extent of tarred roads in France, the essentials of good construction, and the results of experiments with the dust from tarred roads, divers tar and oil emulsions, and deliquescent salts used in road surfaces.

Highway bridges and culverts, C. H. HOYT and W. H. BURR (*U. S. Dept. Agr., Office Pub. Roads Bul. 43, pp. 21, pls. 14, figs. 3*).—This is a revision of Bulletin 39, previously noted (E. S. R., 25, p. 891), and has for its purpose the pointing out of some of the important fundamental principles that govern operations necessary to secure properly designed highway bridges and culverts, together with some facts relating to their construction. A systematic course of procedure in bridge and culvert work is outlined and discussed, as consisting of the following steps: Securing the services of a capable bridge engineer, testing the foundation to determine its suitability, bearing power, and economy, determining the location and making the profile, determining the proper loading, and the making of accurate and economic designs and plans and cost estimates. Plans showing details of structures are also given.

Culvert practice in road building in connection with drainage ditching in Minnesota (*Engin. and Contract., 37 (1912), No. 17, pp. 476, 477, fig. 1*).—Specifications are given for corrugated metal culverts which are put into roads made by using the spoil banks from drainage ditches.

A plan for a small dairy house, E. KELLY and K. E. PARKS (*U. S. Dept. Agr., Bur. Anim. Indus, Circ. 195, pp. 5, figs. 4*).—This contains plans and details for constructing an inexpensive but sanitary dairy house.

The ventilation of stock stables, F. ULRICHS (*Illus. Landw. Ztg., 32 (1912), No. 27, pp. 257, 258*).—The construction of cow stalls relative to ventilation is discussed, the principal method of ventilation dealt with being that by vapor chimneys.

The development of agricultural machinery in Germany, G. FISCHER ET AL. (*Arb. Deut. Landw. Gesell., 1910, No. 177, pp. VIII+436, figs. 325*).—This publication deals with the general development of agricultural machinery in Germany, describing and discussing ground-breaking implements, seeders, and cultivators, harvesters, cleaning and sorting machines, feed-preparing machines,

thrashers, hay balers, dairy machinery, farm engines, electricity in agriculture, and pumps.

Wood used in construction of agricultural implements, F. N. G. KRAMCH (*Farm Implements, 26 (1912), No. 3, pp. 21, 22, 24*).—This article deals with the importance of wood in the construction of agricultural machinery, describing the important wooden parts of different implements, and discussing the relative merits of different kinds of woods when used in the construction of parts of various machines.

The hand-winch stump and tree puller (*Agr. Gaz. N. S. Wales, 23 (1912), No. 1, p. 80*).—This machine has a small winding drum about 1 ft. in diameter, worked with an 8-ft. lever pulled by 2 men. A grab disposes of slack rope and a snatch block doubles the direct drum power, making it equal to about 24 tons. The power is transmitted to a flexible wire rope, one end of which is anchored to the butt of a standing tree, and the other looped around the tree to be pulled, about 10 ft. from the ground. In trials recently conducted at the Grafton experiment station, New South Wales, a swamp mahogany tree 2 ft. 9 in. in diameter was pulled out by the roots in 22 minutes.

Motor cultivation on a farm, H. SAGNIER (*Jour. Agr. Prat., n. ser., 23 (1912), No. 13, pp. 401, 402*).—The operation and cost of operation of an internal combustion motor plow on a farm is discussed.

Examination of a seeding machine for garden or nursery planting, C. FRUWIRTH (*Wiener Landw. Ztg., 62 (1912), No. 23, p. 285, fig. 1*).—A machine is described which is adapted to planting seeds in gardens, nurseries, or experimental plats. It is so constructed as to plant the seeds in rows at the required depth and distance apart, and is intended as a time- and labor-saving apparatus to be used where especial care in planting is required.

Potato-digging machines, G. SEYMOUR (*Jour. Dept. Agr. Victoria, 10 (1912), No. 2, pp. 119–122, figs. 4*).—The construction and operation of several types of potato-digging machines are described.

A wagon for carrying heavy loads (*Masch. Ztg., 10 (1912), No. 7, p. 82, figs. 2*).—A wagon is described which is especially adapted to carrying hogs or cattle or other heavy loads. It is so constructed that the bed can be raised or lowered on a steel frame, thus facilitating the processes of loading or unloading.

New ideas in modern straw balers, FABRICIUS (*Masch. Ztg., 10 (1912), No. 7, pp. 80–82, figs. 3*).—An improved straw baler, some of its accessories, and its operation are described.

RURAL ECONOMICS.

Agricultural credit and cooperation in England and Wales (*Jour. Bd. Agr. [London], 19 (1912), No. 1, pp. 43–50*).—Observations are made showing that although agricultural cooperation has not been established to a very large extent in England and Wales, it has in recent years made marked development in the way of cooperative credit, insurance, purchase, production, sales, etc. The state has contributed to the movement by passing legislation making it possible for the societies to be established and registered at small cost, empowering county councils to aid such societies by money grants or guaranties, and providing funds, through the Agricultural Organization Society, for the propagation of cooperative ideas, the encouragement of new societies, and the combination of individual societies into larger cooperative unions.

Attention is called to the most common form of the small holdings and allotment societies, in which a number of intending small-holders form themselves into a society, which in its corporate capacity negotiates for the hire or pur-

chase of land and makes itself the responsible hirer or purchaser of sufficient land to meet the needs of all of its members. The society performs other functions, as the purchase of seed, manures, implements, and other requirements of members, and collects, prepares, and markets their surplus produce. In 1909 there were 146 such societies, with a membership of 7,925.

Cooperative societies (*Rpt. Indus. and Agr. Coop. Soc. United Kingdom, 1912, pp. LV+273, pls. 5*).—An official report presenting notes and statistics relating to industrial and agricultural cooperative societies in the United Kingdom from 1900 to 1910. The agricultural societies are grouped into 3 main classes, viz, purchase and sales societies, productive societies, and small holdings and allotment societies. "Between 1895 and 1909 the agricultural cooperative societies of all kinds making returns increased from 58 (46 for production and 12 for distribution) for the whole of the United Kingdom, to 653 (317 for production and 336 for distribution), while their combined sales increased from £354,379 to £3,609,172."

Agricultural purchase societies in Italy up to 1910 (*Fed. Ital. Consorzi Agr. Piacenza, 2 (1911), pp. XII+505, figs. 149*).—This book presents notes, tables, maps, charts, etc., showing the work done by the Italian Federation of Agricultural Societies from 1892 to 1910 inclusive. It also includes a summary of the information furnished by 420 of the agricultural societies concerning the economic status of the various localities, together with data showing the numerical relations between the purchase societies, the rural population, and the cultivated area, as well as data on the general consumption of commerical fertilizers and the amount provided through cooperative societies.

The importance of the collective purchase societies is partially brought out in the following table:

Progress of the Italian Federation of Agricultural Societies from 1893 to December 31, 1910.

Year.	Members.		Capital.	Value of goods delivered to members.	Net profits.	Distribution of net profits.			
	Agricultural societies.	Individuals.				Shareholders.	Purchasers.	Employees.	Reserve fund.
			Lire.	*Lire.*	*Lire.*	*Lire.*	*Lire.*	*Lire.*	*Lire.*
1893....	65	207	12,885	711,147	11,009	665	3,458	864	3,948
1895....	94	264	24,804	810,435	7,463	1,143	2,378	594	2,751
1897....	115	296	38,327	2,118,629	13,109	1,087	4,547	1,136	5,202
1900....	221	348	79,681	3,806,789	1,027	886	35	8	87
1902....	300	377	96,692	3,992,139	19,995	988	7,202	1,800	8,202
1905....	460	472	144,110	9,389,188	23,239	1,154	8,370	2,092	9,531
1908....	565	499	180,159	15,686,158	22,603	2,557	7,566	1,891	8,696
1910....	618	522	216,572	13,448,499	23,147	4,039	7,180	1,795	8,337

The importance of the national insurance law as related to agriculture, Schumacher (*Deut. Landw. Presse, 38 (1911), Nos. 96, pp. 1089, 1090; 97, pp. 1105, 1106; 99, pp. 1130–1132; 100, pp. 1141–1143; 101, pp. 1156, 1157; 102, p. 1168*).—This is a series of articles discussing in detail the national insurance law in Germany in its application to agriculture.

An argument for the short-time lease, E. Elijah (*Iowa Agr., 12 (1912), No. 5, pp. 19, 20*).—This article illustrates by concrete examples the economic advantages of short-time as contrasted with long-time leases, pointing out that the short-term lease tends toward friendly relations between landlord and tenant. The landlord can also specify each year just what fields may be plowed up and what ones must be seeded down, thus maintaining the productivity of the soil and insuring a more permanent agriculture.

Prosperity on a rented farm in Iowa, R. NICHOLSON (*World's Work, 23 (1912), No. 6, p. 718*).—This article presents the experience of a landowner in Iowa who sold his 320-acre farm in 1908 at $90 per acre, and leased back 240 acres of it for 5 years. The results were very satisfactory. The net profit, in addition to the interest on the money received for the sale of land, in 1910 was $1,677.60 and promised to be larger in 1911.

Profitableness of agriculture in Argentina, PFANNENSCHMIDT (*Ztschr. Agrarpolitik, 10 (1912), No. 4, pp. 126–143*).—This article presents notes and statistics showing the cost of each factor entering into the production of wheat, flax, oats, and other crops on different kinds of land in Argentina, especially the relative value of efficient labor

The cost of breaking and preparing new land and seeding it to wheat with the more efficient labor and paying for insurance against hail is estimated at 17.6 pesos per hectare (about $6.83 per acre), and with less efficient labor 26.75 pesos. On old land the cost with the more efficient labor is 10.3 pesos per hectare and with less efficient labor 17.85 pesos. The cost of harvesting on both old and new land with the more efficient labor is 9.75 pesos per hectare, and with the less efficient labor 15.25 pesos. The total cost per hectare on new land that will produce 5 quintals per hectare is 38.35 pesos with the more efficient labor, and on old land 31.05 pesos; on new land with less efficient labor 53 pesos, and on old land 44.1 pesos.

Corresponding data are given for other crops and wheat on other grades of land. A bibliography is also included.

High cost of living and agriculture in France, M. LAIR (*Rev. Écon. Internat., 9 (1912), I, No. 3, pp. 496–525*).—This article presents the results of a rather comprehensive research, in which it discusses and illustrates under the following headings a number of causes affecting the cost of living and its relation to agriculture in France: The French market; recent rise of the chief products; identical movement of the custom duties; French agriculture as a national industry; progress of the production; tendency of France to provide for itself; decrease of the agricultural population and scarcity of workmen; difficulties in the use of mechanical and industrial processes; effect of social and fiscal laws on the increasing prices; influence of speculation; and administrative influences.

Agriculture in Egypt, B. O. COWAN (*Breeder's Gaz., 61 (1912), No. 17, pp. 988, 989*).—This is a popular article describing at length the agricultural possibilities of Egypt, together with its drawbacks, due to the ancient agricultural methods still practiced by the Egyptian farmers.

[Agricultural] production (*So. Aust. Statis. Reg., 1910, pt. 3, pp. 1–148*).—This is a statistical register showing the area and distribution of holdings in South Australia in 1910 to be as follows: Total area, 105,686,504 acres; occupied by owners, 7,266,867 acres; occupied by tenants, 874,119 acres; lands held under agreement to purchase from the crown, 2,461,412 acres; crown lands leased, 95,084,106 acres; total area under crops, 2,746,334 acres; under permanent artificially sown grasses, 26,416 acres; previously cropped land lying idle during the season, 2,192,478 acres; new ground cleared during the season, 369,150 acres; land in fallow, 1,369,242 acres; and balance of the holdings, 98,982,524 acres. Persons employed or who regularly assist in farm work are classified as follows: General farming, 34,251 males and 5,398 females; dairying, 1,602 males and 10,186 females; and pastoral, 5,166 males and 891 females.

Other statistics are given showing the area under each crop, the produce thereof for a period of years and the average market price, the number, description, and value of live stock, live stock products, etc.

Agricultural statistics (*Statis. Abs. Prin. and Other For. Countries [Gt. Brit.]*, *37 (1899–1910)*, *pp. 310–331*).—A statistical abstract showing the acreage under crops, yields, number of live stock, etc., in each year from 1899 to 1910 in the following countries: Russia, Norway, Sweden, Denmark, Germany, Netherlands, Belgium, France, Spain, Italy, Austria, Hungary, Bulgaria, Roumania, Algeria, Argentina, Uruguay, Japan, Great Britian, and the United States.

Foreign crops, March, 1912, C. M. DAUGHERTY (*U. S. Dept. Agr., Bur. Statis. Circ. 30*, *pp. 12*).—Notes and statistics showing area, production, exports, and price of the principal agricultural crops and livestock in Argentina for a number of years are here presented. Wheat being the principal crop, it is of interest to note that the area has increased from 2,970,656 acres in 1890–91 to 17,037,545 acres in 1911–12, and the yield from 31,048,117 bu. to 170,562,553 bu. The other leading crops are alfalfa, corn, and flaxseed, Argentina being the principal producer of flaxseed.

AGRICULTURAL EDUCATION.

Education for agriculture, F. B. MUMFORD (*Ann. Amer. Acad. Polit. and Soc. Sci., 40 (1912), No. 129, pp. 19, 20*).—This article emphasizes the importance of those types of education which demonstrate their efficiency in training men and women for the social, economic, and political duties of the rural communities and the State at large. It further notes that the opportunity for giving such training in schools teaching agriculture is demonstrated by the increasing demand for farm managers, teachers, investigators, various gricultural experts, and other men and women who are to be in a position to make large contributions toward the solution of these problems.

The country school, H. W. FOGHT (*Ann. Amer. Acad. Polit. and Soc. Sci., 40 (1912), No. 129, pp. 149–157*).—In discussing the vitalizing influence of the ideal country school as a factor entering into the socialization of the new rural life, and as the form of education which is to reflect the daily life and interests of the rural community, the author points out that such a school must give expression to at least two things: (1) Good scientific farming, rendering ample returns for the labor expended, and (2) a rural social life satisfactory to those living in it. It must further require at least three things of the teacher: (1) He must be strong enough to establish himself as a leader in the community where he lives and labors; (2) he must have a good grasp on the organization and management of the new kind of farm schools; and (3) he must show expert ability in dealing with the redirected school curriculum.

Referring to the charges frequently made against the rural school, that it has drawn too much of its substance from sources foreign to rural needs, and that it has failed in other ways to keep pace with the demands of our rapidly developing agricultural life, the author suggests that, in order to check this tendency and so redirect the work that the rural school may become rooted to the soil in such a way as to become the chief agency in the social and economic reconstruction of rural life, there be: (1) A thorough redirection of the subject matter taught in the schools; (2) a general reorganization of the entire working staff of administrators, supervisors, and instructors; and (3) the rebuilding in many instances of the entire school plant.

Rules, regulations, and laws relating to high and graded schools (*Minn. [Dept. Pub. Instr.] Bul. 35, 1912, pp. 50+31*).—This bulletin includes, among others, rules of the department applying to high and graded schools maintaining departments of agriculture and home economics or manual training, laws relating to the teaching of agricultural and industrial work, required equipment, etc.

Teachers' extension schools, G. A. BRICKER (*School Rev., 20 (1912), No. 4, pp. 266–270*).—The author points out that federal funds derived from the Nelson Amendment are available in each State for conducting teachers' extension schools in agricultural education through the initiative of the land-grant colleges, and gives an account of the organization and management of 3 such which were established in Ohio, at Circleville on October 28, 1911, and at Mt. Vernon and Van Wert on January 13 and 20, 1912, according to a plan which he is working out experimentally under the auspices of the College of Education of the Ohio State University.

The Scottish system of continuation schools, E. G. COOLEY (*Vocational Ed., 1 (1912), No. 4, pp. 225–242*).—In this article the author gives an account of the system of continuation schools in Scotland, including the plan of continuation schools in Edinburgh. In this there are (1) classes for the completion of general elementary education, including instruction in needlework, cookery, laundering, dressmaking, and millinery; (2) classes for elementary instruction in special subjects, among which are horticulture and any industry the scientific principles underlying which admit of systematic exposition, and handwork including cookery, laundering, and dairy work; and (3) organized courses of systematic instruction to fit students for the practice of particular crafts, industries, or occupations approved by the department of education, among which courses is one in agriculture and rural industries.

The "Landwirtschaftliche Institut" of the University of Halle, Germany, H. C. PRICE (*Agr. Student, 18 (1912), No. 8, pp. 464–466, figs. 2*).—A brief account is given of the organization and equipment of the agricultural institute of the University of Halle, which is especially notable because it was the first institute of its kind established in a university (in 1862), and also because it has the largest number of students (366 last year and 381 this year) of any of the agricultural institutes of the German universities. The subject of agriculture is divided into 3 main dvisions, (1) agronomy, (2) animal husbandry and dairying, and (3) farm management. All other subjects are made secondary or given as independent courses by special lecturers as in the case of horticulture. This is given by the director of the Province Fruit Experiment Station, which is entirely separate from the university but located near Halle. The work consists principally of lectures. Class rolls and examinations are entirely lacking except that a student must be examined when he wants a teacher's certificate, a diploma, or a doctor's degree.

Reports on agricultural and housekeeping schools for 1910–11 (*Aarsber. Offentl. Foranst. Landbr. Fremme, 1911, II, pp. 280*).—Brief accounts are given of the agricultural schools and housekeeping schools in Norway.

Agricultural nature study, C. F. PALMER (*Addresses and Proc. Nat. Ed. Assoc., 49 (1911), pp. 1118–1126*).—An address before the National Education Association, San Francisco, Cal., July 8–14, 1911, in which the author discusses the importance of instruction in agricultural nature study and outlines the general scope of such work, showing particular phases of the work best adapted to different school grades. The greatest drawback is pointed out as the lack of properly trained teachers and the lack of understanding of the mutual relationship between the biological and physical sciences. He notes how this difficulty is being overcome in many places by special and summer courses on the subject in normal schools and agricultural colleges.

First annual report of the School Garden Association of America (*Ann. Rpt. School Garden Assoc. America, 1 (1912), pp. 32, figs. 12*).—This includes reports of the officers and proceedings and other data.

Kentucky Arbor and Bird Day, 1911, ETHEL REID (*Frankfort, Ky.: Dept. Ed., 1911, pp. 149, pls. 10, figs. 18*).—This compilation consists of a history of

Arbor Day and Bird Day, suggestions for teachers and pupils, programs, and lessons, poems, and music on trees, flowers, and birds.

Report of committee on courses of study in agriculture, E. C. BISHOP (*Addresses and Proc. Nat. Ed. Assoc., 49 (1911), pp. 1138–1152*).—This report, submitted to the National Education Association, San Francisco, Cal., July 8–14, 1911, makes general inquiries into the scope of agricultural education and its relation to present-day principles in education, and presents suggestions as to specific courses in agriculture, the governing influences in the arrangement of such courses, and the pedagogical procedure in organizing the subject in schools maintaining the usual general public school courses of study. In addition to an outline of the work as pursued in a few of the States, a summary of successful practices in teaching agriculture in the rural school with one teacher is presented.

Spring laboratory methods, S. A. MINEAR (*Bul. Okla. Agr. and Mech. Col., 8 (1912), No. 26, pp. 8, figs. 9*).—Laboratory exercises (1) to increase the production of corn by judicious selection of seed ears, (2) the determination of good cotton seed for planting purposes, (3) a practical study of the yield of oats, (4) to demonstrate how plants feed, (5) the amount of moisture, and (6) the loss of moisture after rains, are outlined by the author.

Potato studies for schools, J. W. HUNGATE (*Dept. Agr. State Normal School [Cheney, Wash.], Bul. A, No. 2, 1912, pp. 15, figs. 5*).—This pamphlet gives instructions as to planting, cultivating, and harvesting the potato crop, including exercises on the structure, albumin, and water content of the potato, its use for seed planting operations, treatment for scab, seed selection, storing, and scoring potatoes.

MISCELLANEOUS.

Annual Reports of the Department of Agriculture, 1911 (*U. S. Dept. Agr. Rpts. 1911, pp. 1010*).—This consists of the report of the Secretary and heads of Bureaus. The various reports are also issued as separates. A portion of the report of the Secretary, comprising a discussion of the economic results of cold storage, is abstracted on page 164 of this issue.

Twenty-seventh Annual Report of the Bureau of Animal Industry, 1910 (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910, pp. 573, pls. 42, figs. 75*).—This contains a report of the Chief of the Bureau for the fiscal year ended June 30, 1910, numerous articles abstracted elsewhere in this issue, and a list of the publications of the Bureau during 1910. An appendix contains the rules and regulations of the Secretary of Agriculture relating to animal industry issued during 1910.

Annual Report of Hawaii Station, 1911 (*Hawaii Sta. Rpt. 1911, pp. 63, pls. 7, figs. 6*).—This contains the organization list, a summary by the special agent in charge as to the investigations of the year, and reports by the entomologist, horticulturist, chemist, and agronomist. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Twenty-fourth Annual Report of Michigan Station, 1911 (*Michigan Sta. Rpt. 1911, pp. 147–510, pls. 2, figs. 51*).—This contains reports of the director and heads of departments on the work of the station during the year, the experimental features of which are abstracted elsewhere in this issue, reprints of Bulletins 262 to 264, Special Bulletin 54, Technical Bulletins 5 to 10, and Circulars 10 and 11, previously noted, and a financial statement for the fiscal year ended June 30, 1911.

NOTES.

California University and Station.—Dean T. F. Hunt, of the Pennsylvania College and Station, has been appointed to succeed Dean Wickson as dean and director. Recent appointments as instructors include James Koeber in farm mechanics, William H. Arnold in chemistry and botany, W. F. Gericke and Paul S. Burgess in soils, and Ralph H. Taylor in horticulture. W. B. Herms has been promoted to the assistant professorship of applied parasitology, and W. G. Hummel to the assistant professorship of agricultural education.

An additional substation was opened May 25 at Meloland in Imperial County, where a tract of about 40 acres has been secured and buildings and water supply provided. Attention is to be given to demonstration work with fruits, grains, forage plants, cotton, and other crops. Walter H. Packard will be in charge of the substation.

Iowa College and Station.—W. J. Kennedy, former head of the animal husbandry department, has been appointed superintendent of agricultural extension, vice P. G. Holden, resigned, and will be succeeded by W. H. Pew. A. V. Storm, head of the department of agricultural education, has resigned to accept a similar position at the University of Minnesota. Nelson C. Brown, assistant professor of forestry, has resigned to become assistant professor of forest utilization in the New York State School of Forestry at Syracuse University.

Other resignations include M. L. King, experimentalist in agricultural engineering, and in the extension division A. H. Snyder, Murl McDonald, G. R. Bliss, and A. A. Burger. Robert Snyder and E. H. Kellogg have been appointed assistants in soils in connection with the position made vacant by the resignation of A. A. Wells.

A school of silo construction was held at the college June 3 to 7, with an attendance of about 60.

Kansas College and Station.—W. A. Cochel, of the Pennsylvania College and Station, has accepted the position of animal husbandman, beginning July 1.

Louisiana Stations.—The general assembly appropriated $50,000 at its recent session for the support of the agricultural schools of the State, an increase of $25,000 over last year. An appropriation of $3,000 for the repair of the sugar house at the Audubon Park Station was also granted.

A tract of 60 acres has been purchased for the use of the station at Baton Rouge adjacent to its present holdings.

The agricultural demonstration train has completed a trip of 4,625 miles over 15 different railroads, attracting an estimated attendance of 142,885.

E. J. Watson, horticulturist at the Calhoun Station, has resigned to take effect August 1.

Massachusetts College and Station.—An offer of $150 yearly for three years has been made by F. Lothrop Ames for prizes to the three men doing the best work in live stock judging. The fund will be utilized in defraying the expenses of competition in the live stock judging contests at the National Dairy Show.

Frank F. Moon, associate professor of forestry, has resigned to become professor of forest engineering at the New York State College of Forestry at Syracuse University. Dr. Ernest Anderson, research instructor in chemistry at the University of Chicago, has been appointed assistant professor of general and physical chemistry.

In the station, Director W. P. Brooks has been granted leave of absence, and Vice Director J. B. Lindsey is temporarily in charge. Herbert J. Baker, secretary to the director, resigned July 1. C. L. Beals and Howard A. Turner, 1912 graduates of the college, received appointments July 1, the former as assistant chemist in the fertilizer section, and the latter as graduate assistant in horticulture.

Minnesota University and Station.—A new building, 168 by 169 feet, is under construction for the department of agricultural engineering, and it is hoped to complete at least the portion devoted to shop work early in 1913. A girls' dormitory, costing $50,000, has recently been completed at Morris, and a similar dormitory for boys is to be begun in the near future. A science building, costing $40,000, is nearing completion at Crookston.

W. A. McKerrow has been appointed specialist in animal husbandry in the extension division, with the rank of assistant professor, to succeed W. H. Tomhave, who has accepted the position of animal husbandman at the Pennsylvania College and Station.

Mississippi College and Station.—G. R. Hightower succeeded J. C. Hardy as president of the college July 1. R. L. Shields has resigned as professor of animal husbandry to become professor of animal husbandry and dairying at Clemson College and Station, and was succeeded by Archibald Smith September 1. Other appointments include J. K. Morrison as college and station poultryman, Dr. C. F. Briscoe as station bacteriologist, and Dr. J. C. Robert as dean of the school of agriculture and professor of agronomy.

Nebraska University and Station.—O. L. Sponsler, in charge of the forestry work, has resigned to accept the position of junior professor of silviculture in the University of Michigan. R. F. Howard, assistant professor of horticulture and assistant horticulturist, has resigned to accept a similar position in the University of Wisconsin, beginning September 1.

New Hampshire College and Station.—T. R. Arkell, associate professor of animal husbandry and animal husbandman, has resigned to accept a position with the Canadian Department of Agriculture as head of the sheep division. He will investigate for the present sheep breeding and the wool industry in Manitoba, Saskatchewan, and Alberta.

Cornell University.—The recent appropriations of the legislature authorize the construction of a $100,000 forestry wing of the proposed plant industry building, a $91,000 animal husbandry laboratory building, a $38,000 live stock judging pavilion, and a $100,000 extension to the agronomy wing of the present main building. In addition, $265,000 was granted for current expenses of the college of agriculture, $50,000 for extension work, $30,000 for equipping the home economics building, $15,000 for equipping the poultry husbandry building, $4,000 for the summer school, $20,000 for additional instruction in physics and chemistry, $20,000 for various additions, grading and improvement of grounds, and $2,000 for investigations of the diseases of the gladioli and other bulbous plants. Excavations are under way for the new agricultural auditorium building, which will be perhaps the most imposing building of the university and will serve as a connecting architectural link between the agricultural group and the main campus. It will be one of the largest auditoriums in western New York, seating over 2,500 people, besides affording additional facilities for class rooms and laboratories. The contract calls for its completion November 1.

Samuel N. Spring, state forester of Connecticut, has been appointed professor of forestry. Other appointments include the following: As instructors, M. J. Prucha and G. R. Hill, jr., in plant physiology, Charles Gregory and C. P. Smith in plant pathology, H. O. Buckman in soil technology, C. E. Ladd in farm management, H. M. Pickrill and T. J. McInerney in dairy industry, Clara Brown in home economics, E. M. Tuttle in rural education, and Royal Gilkey in extension teaching; and as assistants, J. T. Francis, Charles Chubb, and L. M. Massey in plant pathology, T. E. Schreiner in poultry husbandry, and E. D. Montillon in rural art.

North Carolina College Station.—Guy W. Wilson has resigned as assistant in plant diseases to take up graduate work at Columbia University.

Ohio State University.—A course in plant genetics is to be offered for the first time next year. F. R. Marshall has accepted a position as head of the animal husbandry department of the California University and Station.

Pennsylvania Institute of Animal Nutrition.—Director H. P. Armsby has been elected a foreign member of the Royal Academy of Agriculture of Sweden.

Rhode Island College and Station.—Philip H. Wessels, who was formerly assistant chemist and who has been a graduate student at the University of Wisconsin, has returned as first assistant chemist to the station. Leroy F. Whipple has resigned as assistant chemist to engage in commercial work. Frank O. Fitts, a 1912 graduate of the Massachusetts College, has been appointed assistant chemist, and George E. Merkle, also a graduate of the Massachusetts College, has been appointed assistant in agronomy and chemistry in the college and station.

Clemson College and Station.—W. L. Hutchinson, formerly director of the Mississippi Station, has been appointed to the professorship of agronomy. Recent resignations include those of J. M. Napier as assistant professor of agronomy to engage in farming; W. P. Gee as assistant professor of entomology to take up graduate work at the University of California; C. C. Vincent as associate professor of horticulture to accept a position with the University of Idaho; L. A. Niven as assistant in horticulture in the extension division to engage in horticultural journalism; and Dr. W. F. Burleigh as assistant veterinarian to engage in veterinary practice.

R. W. Simpson, a life member of the board of trustees and for over twenty years its president, died July 11 at the age of 72 years. As executor of the will of the late Thomas G. Clemson, which provided a considerable bequest for an agricultural and mechanical college in South Carolina, he was prominently identified with the establishment of the present institution.

West Virginia University and Station.—O. M. Johnson, of Ohio State University, has been appointed associate professor of farm management and in charge of farm management in the station, in cooperation with the Farm Management Investigations of this Department. P. B. Bennetch, of the State School of Agriculture at Canton, N. Y., has been appointed assistant professor of dairying in the university and dairyman in the station. L. M. Peairs, of the Kansas College and Station, has been appointed associate professor of entomology and entomologist, vice F. E. Brooks, resigned. K. H. Knudsen, assistant chemist, has resigned to engage in commercial work in Norway. In the department of horticulture, A. L. Dacy has been appointed associate professor of horticulture, E. C. Auchter and L. F. Sutton assistants, and A. B. Brooks, a 1912 graduate of the university, instructor in the university and assistant in the station.

The first state country life conference had a successful session July 15 to 18.

Office of Experiment Stations.—S. H. McCrory, connected with the field work of the Drainage Investigations of this Office since 1907, has been appointed engineer in charge of drainage work, and has entered upon his duties. J. O.

Rankin, who has been associated with the field crops section of *Experiment Station Record*, has resigned to become editor for the Minnesota University and Station.

Seaman A. Knapp School of Country Life.—A grant of $250,000 by the General Education Board has been announced to the George Peabody College for Teachers, at Nashville, Tenn. This fund is to be utilized for the establishment of the Seaman A. Knapp School of Country Life, which will give special attention to the training of teachers for rural schools, and in accordance with the usual policy of the board is contingent upon the raising of an equal sum by the institution.

Royal International Horticultural Exhibition.—This exhibition, held in the grounds of the Royal Hospital, Chelsea, England, comprised numerous scientific exhibits from various institutions and two conferences, one on May 23 on horticultural education, and the other on May 24 on legislation in connection with insect pests. Papers were contributed to the educational conference by Dean Bailey, of Cornell University, on Horticultural Education in America; K. Weinhausen, of Berlin, on Horticultural Education in Germany; Prof. A. Buyssens, of the School of Horticulture at Vilvorde, on Horticultural Education in Belgium; and W. Hales on the Education of a Gardener. The value of importation regulations as a means of preventing the introduction of plant pests was discussed by Prof. L. Ritzema Bos, of Holland. A. G. L. Rogers considered the aim of legislation in Great Britain, and A. W. Sutton discussed import dues and regulations. Legislation in connection with insect pests was discussed by H. Maxwell-Lefroy, of India, and that for fungus diseases by H. T. Güssow, botanist for the Canadian Department of Agriculture.

Hon. Walter Runciman, president of the Board of Agriculture and Fisheries, gave an address in which he announced the establishment of a new division of the board for exclusive attention to horticultural interests. A. G. L. Rogers has been appointed head of the division, and is to be assisted by an entomological expert, eight other experts, and a clerical staff.

Prospective Agricultural Meetings.—Announcement is made of the seventh International Dry Farming Congress, which will meet at Lethbridge, Alberta, October 21 to 26. The twentieth annual Irrigation Congress will be held at Salt Lake City, Utah, September 30 to October 8. The American Breeders' Association will meet at Columbia, S. C., January 24 to 27, 1913, in connection with the fifth National Corn Exposition.

Miscellaneous.—The Franklin Institute of Philadelphia has awarded to Dr. Oswald Schreiner and Elbert C. Lathrop, of the Bureau of Soils of this Department, the Edward Longstreth medal of merit for a paper entitled The Distribution of Organic Constituents in Soils, which appeared in the August, 1911, issue of the *Journal of the Franklin Institute.*

Dr. E. J. Russell has been appointed director of the Rothamsted Station, in succession to A. D. Hall, whose resignation has been previously noted.

William R. Smith, for sixty years superintendent of the National Botanic Gardens, died at Washington, D. C., July 7, at the age of 84 years.

The death is noted of Dr. Ernst Schulze, professor of agricultural chemistry at the Zurich Technological Institute, at the age of 72 years.

EXPERIMENT STATION RECORD.

VOL. XXVII. ABSTRACT NUMBER. NO. 3.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Metabolic water: Its production and rôle in vital phenomena, S. M. BABCOCK (*Wisconsin Sta. Research Bul. 22, pp. 87–181*).—The author believes that sufficient distinction has not been made in plant and animal physiology between the function of water which is imbibed and that which is produced as a result of metabolism—oxidation, dehydration of carbohydrates, etc. The metabolic production of water is always associated with the absorption of free oxygen and an evolution of carbon dioxid, the latter being practically in the same ratio as the absorbed oxygen. The water so produced is in many instances essential to the life of the organism.

The results of some experiments with seeds (*Zea mays*), made for the purpose of determining the influence of drying upon germination, show that seeds which were dried for a considerable length of time lost in germinating power and showed weak sprout production, while those dried and immersed in hydrogen peroxid did not germinate at all.

The rate of respiration is within certain limits governed by the amount and distribution of water contained in the seed. The presence of carbon dioxid was found to retard germination somewhat, the retardation being proportional to the amount of oxygen present. Corn stored in an atmosphere of carbon dioxid in a sealed flask, for a period of 30 days, gave evidences of intra-molecular respiration (or anaerobic fermentation), and showed an increase of water from 29.66 to 33.94 per cent. None of this corn germinated when tested later.

Corn treated with solutions of glucose (3 per cent) showed a much higher percentage of germination than that treated with water alone. The embryo of seeds (corn) was found to absorb water more rapidly than the endosperm.

Germination tests conducted with hydrogen peroxid, in strengths from ½ to 3 per cent, showed "that a very satisfactory method of making germination tests is to place the seeds between filter papers that are afterwards moistened with a 1½ per cent solution of hydrogen peroxid. In this way a large excess of the reagent is avoided and growth of parasitic organisms prevented. It is well in this case to renew the solution after 24 hours, the surplus liquid being poured off or absorbed by dry filter paper. In general, small seeds such as tobacco, timothy, clover, etc., have not germinated as readily with hydrogen peroxid as when water only was employed. Good results have been obtained with corn, wheat, rye, barley, buckwheat, peas, and beans either when immersed in the reagent or when placed between filter papers and moistened with it. Oats have not germinated well, by either method, unless the hulls were previously removed; when this was done oats germinated as well in hydrogen peroxid as

hydrogen peroxid than in water. This suggests that the method may serve the by a low percentage of germination, requires a longer time for germination in hydrogen peroxid than in water. This suggests that the method may serve the purpose of discriminating between doubtful and good seed."

The water content of sprouts, roots, and stems after separation from the embryo, 48 hours after germination, was found to range from 84.8 to 90.17 per cent (average 87.75 per cent). The moisture content of soaked grain was less than that of germinated grain, the most striking increase taking place in the embryo. The percentage increase in the germinated grain can not be all attributed to imbibed water, and in all probability is due to the production of metabolic water. In the case of mature plants, wilting is in part produced by the abstraction of water from the leaves, which is needed for the hydrolytic processes which are going on in the plant during sunshine.

Tubers and bulbs when stimulated to sprouting produce moisture as a result of dehydration and oxidation processes, to an amount much greater than was originally present in the tuber or bulb. The most water is present in the sprout. A similar process occurs in fruits. Immature seeds when exposed to the air for a time can be made to germinate. The lack of germinating power in the original seed as picked is due to the fact that certain necessary specific enzyms are not present. The theory of Naegeli in regard to the nature of imbibition in plants is criticised. "It seems far simpler to account for the phenomena of imbibition by a direct molecular combination of the substances composing the tissues of organized bodies and water, than by assuming the existence of micellæ, the structure and form of which can not be demonstrated."

Seeds when immersed in water generate a certain amount of heat which is due to the union of the starch with water. When sprouting begins it is due to the oxidation of sugar. "The final ripening changes in most fruits proceed fully as rapidly after removal from the tree as when left undisturbed. These changes are the result of direct respiration of living cells in the fruit which continue to function after the fruit is picked. The increase in succulence during ripening is partly due to the production of metabolic water through respiration and partly to the increased solubility of the products formed. It is not due to water derived from the parent plant. The water content is proportionately greater in ripe fruit than in green fruit, in spite of considerable loss of water through evaporation, even though the fruit be ripened off the tree."

With many animals the most of the water required in their metabolism is derived from the oxidation of organic nutrients. "Many varieties of insects and other animals that excrete the waste products of protein metabolism as salts of uric acid in solid form require no free water at any time, except the small amount present in air-dried food, the water content of which is usually less than 10 per cent. This is possible because the insoluble nature of uric acid renders it but slightly poisonous and permits of its excretion with a minimum loss of water. This is the case with the clothes moths, the grain weevils, the bee moth, and a large number of insects that live upon air-dried food throughout every stage of their development. The larvæ of these insects contain from 5 to 10 times the amount of free water contained in their food. Some of these insects are capable of living long periods upon dry food in an atmosphere containing no moisture. No doubt they would live indefinitely upon dry food if this could be supplied without exposure to dry air which enormously increases the loss of water by evaporation."

Contribution to our knowledge of plant phosphatids, V. Nadson (*Hoppe-Seyler's Ztschr. Physiol. Chem., 76 (1911), No. 1, pp. 1–25; abs. in Zentbl. Physiol., 25 (1911), No. 26, pp. 1222, 1223; Zentbl. Expt. Med., 1 (1912), No. 2, p.*

58).—By extracting the seeds of *Lupinus albus* a phosphate complex was obtained which consisted of a portion easily soluble in alcohol and a portion difficultly soluble. The latter has been previously investigated by Winterstein and Stegman (E. S. R., 23, p. 7).

Fractionations made with alcohol, ether, and acetone of the portion easily soluble in alcohol yielded 12 different fractions, of which 3 could be considered true phosphatids. The rest were more or less pure, but could not be considered definite carbohydrates, and in all probability were mixtures or compounds of carbohydrates and nitrogen-containing substances. The fractions soluble in acetone were found to contain phosphatids, odoriferous substances, lipochrome, and possibly stearin and fats.

The 3 phosphatids contained 3.46, 4.31, and 3.33 per cent of phosphorus, and 1.38, 1.56, and 1.46 per cent of nitrogen, respectively. The cleavage products contained stearin, palmitin, and unsaturated fatty acids, and 2 contained glycero-phosphoric acid. One of the preparations also contained an organic base which was not studied; another cholin; and another contained instead of cholin a base having the composition $C_9H_{26}N_2O_2$ and named "Vidin."

The localization of betain in plants, V. Staněk (*Hoppe-Seyler's Ztschr. Physiol. Chem., 72 (1911), No. 5–6, pp. 402–409; abs. in Jour. Chem. Soc. [London], 100 (1911), No. 587, II, pp. 818, 819*).—Analyses were made of various parts of *Beta vulgaris saccharum*, *Triticum vulgare*, *Lycium barbarum*, *Atriplex canescens*, and *Amaranthus retroflexus*, by a method which is described. It was found that betains are very irregularly located in the plant. A large amount of betain is present in the leaves during the early stage of growth, but gradually decreases as ripening sets in.

"Young shoots are also rich in betain, while the bark and wood (Lycium and Atriplex) contain very little. The root and leaves of Amaranthus contain 0.48 and 2.16 per cent respectively, and those of the sugar beet 0.95 to 1.2 per cent and 2.62 per cent betain. The seeds of all the plants tested were strikingly poor in this compound. The whole of the analyses appear to indicate a localization of betain at points of energetic physiological activity. The high percentages found in young leaves, shoots, and the root of a biennial plant such as sugar beet lead to the conclusions that betain plays an important part in the nitrogen metabolism of plants, but does not serve as a reserve foodstuff."

Investigations in regard to the betains occurring in plants, II, E. Schulze and G. Trier (*Hoppe-Seyler's Ztschr. Physiol. Chem., 76 (1912), No. 4, pp. 258–290*).—Continuing the work previously noted (E. S. R., 26, p. 713), the authors find that sunflower seeds (*Helianthus annuus*) in the form of sunflower cake contain very little betain, about ½ gm. of betain chlorid being obtained from 5 gm. of the cake. The leaves and stems of *H. tuberosus* yielded 1.5 gm. of betain chlorid from 6 gm. of material, while the bulbs gave 2 gm. of this salt from 25 gm. of material. The unripe seed coats of the vetch (*Vicia sativa*) yielded 1.33 gm. of betain chlorid from 488 gm. of dry substance, while the seed itself yielded from 100 gm. an average of 0.38 gm. of betain chlorid. Green vetch plants harvested before the blooming stage showed an average of 0.238 gm. of betain chlorid per 100 gm. of dry substance. The fresh green stems and leaves of peas (*Pisum sativum*) gave an average of 0.088 gm. of trigonellin per 100 gm. dry substance, as compared with 0.05 gm. of trigonellin from the seeds.

Black root (*Scorzonera hispanica*), the tubers of *Dahlia variabilis*, and chicory root (*Cichorium intybus*) all contained trigonellin, but the former two contained only very small amounts. From chicory root another base besides cholin was obtained, the amount, however, being so small that the product

could not be further studied. The leaves and stems of the young plants of *Stachys tuberifera* were found to contain stachydrin, which could be isolated very easily and in a pure state.

In addition to stachydrin, betonicin ($C_7H_{13}NO_3$), a new base (which is provisionally considered oxystachydrin by the authors) was isolated from the leaves and stems of *Betonica officinalis*. Trigonellin and betonicin were obtained from the leaves and stems during the blooming and ripening stage from *S. sylvatica*. *Salvia pratensis* yielded cholin, but no stachydrin or other betain could be found. Young leaves of *Citrus aurantium* yielded a much larger amount of stachydrin than old leaves.

The authors hold that betains are by-products of plant metabolism, which no longer take part in the physiological processes of the plant.

Some further contributions in regard to the occurrence of betains in the plant kingdom, K. Yoshimura and G. Trier (*Hoppe-Seyler's Ztschr. Physiol. Chem., 77 (1912), No. 4, pp. 290-302*).—A continuation of the work noted above.

It is shown that no betain is present in *Glechoma hederacea* or *Fagara xanthoxyloides*, but cholin was noted in the former. Stachydrin was isolated from the leaves and stems of *Galeopsis grandiflora* (in the optically inactive form, which is the first time it has been noted), and in lemon peel, but not in the leaves and stems of *Ajuga reptans* and rosemary flowers. Cholin was present in the latter 2 plants. Stachydrin and cholin were also detected in the flowers of *Chrysanthemum cinrariifolium*, while trigonellin was detected in the leaves and stems of *Mirabilis jalapa*.

Micro-organisms and fermentation, A. Jörgensen (*London, 1911, 4. ed. rev., pp. XI+489, figs. 101*).—This is the fourth revised English edition of this work, which deals with the physiology of fermentation. Among the topics discussed are the microscopical and physiological examination of material; biological examination of air and water; the various sorts of bacteria, molds, and yeasts, especially those of importance industrially; theories of fermentation; the action of yeasts; and the pure culure of yeast on a large scale.

Silage fermentation, W. M. Esten and C. J. Mason (*Connecticut Storrs Sta. Bul. 70, pp. 40, figs. 3*).—This investigation considers particularly the symbiotic fermentation which occurs during the preparation of silage with a view of determining the best conditions forpreparing silage.

From some tests made in experimental silos (2-qt. milk bottles filled tightly with corn ground in a meat choper and sealed), kept at temperatures of 40, 50, and 70° F., it appears that the latter temperature is the best one for producing preservative qualities, while at 40° the most destructive fermentation takes place. The temperature of 50° favors the production of propionic and butyric acids.

"This experiment explains why silage does not keep as well in cement, stone, or brick silos. The cement stone, and brick conduct away the heat generated in a silo and the acid fementation is checked unless the temperature of the air at siloing time is warmerthan normal." According to this the appearance of the silage is not always thecomplete criterion for judging the quality of silage. Chemical and odor tests musbe made in order to get a good idea of the quality.

The acidity of silage (chidy lactic and acetic acids) was found to be in 5 years' testing nearly always1 per cent (80 being the molecular weight considered in the determinations) ir the total weight of silage, although at times it was over 2 per cent. The avrage is probably 1.5 per cent. In the miscellaneous examinations of the silge juice it is shown that at least 7 distinct varieties of yeast were present, all f which were facultative anaerobes. Among 13 colonies picked out from plate 10 were capable of fermenting dextrose, 3 fermenting dextrose and saccharee only, and 3 fermenting none of the 3

sugars. Succinic acid was found to be present in the fermented silage. Although acetic acid was produced in the silage the author was at a loss to explain why this acid is produced from the alcohol when an abundance of oxygen was not present.

Observations of the temperature of silage for a period of 5 years showed the highest temperature at the surface to be 126°. The highest interior temperature, taken 5 ft. from the bottom and from 1 to 2½ ft. from the edge, was 86°. "The highest temperatures [were] 6 in. from the surface. More than 3 ft. from the surface no temperature above 82.40 has been observed during the 5 years of observations on silage fermentations of all silos examined. High temperatures mean silage destruction when they are above 100°, and not silage formation. The best temperature for silage fermentation is from 75 to 85° F. because when these temperatures are found in a silo the best silage is found. At this temperature the acid is produced most rapidly and stops the growth of undesirable bacteria much sooner than at 65 to 70°. At a temperature below 65° during the fermentation stage a poor quality of silage is produced." The course of the bacterial growth and temperature curves of the silage were nearly parallel.

The number of acid-producing bacteria, of which the author makes 3 divisions, according to their fermentability, varied with the different years. A cane-sugar medium was found to be better than a lactose medium for differentiating acid from nonacid-producing bacteria. The methods of sampling silage and plating for bacterial counts are given.

As a conclusion the author points out the following: "Any farm product can be siloed providing there is sufficient sugar in the mixture to be fermented into acid to preserve it. The following mixtures silo successfully and make a very desirable and nearly balanced ration: Alfalfa and rye, clover and timothy or wheat or oats, oats and peas, and corn and cowpeas or soy beans. A round wooden stave silo, taking all things into consideration, has proven most satisfactory." A bibliography is appended.

Agricultural chemistry, R. Otto (*Grundzüge der Agrikulturchemie. Berlin, 1911, 2. ed. rev., pp. VIII+302, figs. 42*).—A second edition, revised and enlarged (E. S. R., 10, p. 715).

Chemical-technical methods of analysis, edited by G. Lunge and E. Berl (*Chemisch-technische Untersuchungsmethoden. Berlin, 1911, 6. ed., rev. and enl., vols. 3, pp. XXI+1023, figs. 150; 4, pp. XIX+1061, pls. 4, figs. 56*).—These volumes deal with general and special methods for analyzing fertilizers, feeding stuffs, gases, the products of gas manufacture, mineral oils, lubricating materials, fats and waxes, resins, balsams and gum resins, rubber, essential oils, the materials and products of cane and beet-sugar manufacture, starch, dextrin, alcohol, wine, vinegar, beer, paper, leather, citric acid, coal-tar dyes, and textile fibers.

Theory and practice of volumetric analysis, A. Classen (*Theorie und Praxis der Massanalyse. Leipsic, 1912, pp. IX+772, figs. 46*).—This work, chiefly based upon the results obtained in the inorganic and electrochemical laboratory of the technical high school at Achen, deals with indicators, measuring apparatus, titrametric systems, methods for saturation analysis, acidimetric methods, oxidation and reduction methods, iodometry, and analysis by precipitation.

Note on the neutral permanganate method for the availability of organic nitrogen, J. P. Street (*Abs. in Science, n. ser., 35 (1912), No. 898, p. 427*).—Adding 1 gm. of sodium carbonate to the neutral permanganate solution, just before adding the material to be examined, overcomes much of the loss in availability which occurs when high-grade ammoniates are mixed with large amounts of acid phosphate.

"Results on many organic ammoniates in presence of acid phosphate are given, showing that the method does differentiate between high and low-grade materials."

Activity of organic nitrogen as measured by the alkaline permanganate method, C. H. JONES (*Abs. in Science, n. ser., 35 (1912), No. 898, pp. 426, 427*).—After giving a detailed description of the alkaline permanganate method and the form now used for reporting the results, the author reports results on 14 different crude nitrogenous stock samples, 8 commercial fertilizers, and 13 mixtures of known composition, and interprets them from a standpoint of nitrogen activity.

"A method is also presented for determining the percentage of 'nitrogen in the organic and volatile matter.' Its application to fertilizers and crude stock as a means of determining whether the organic nitrogen present came from materials rich or poor in that element is discussed."

A method for determining phosphoric anhydrid colorimetrically, N. PASSERINI (*Staz. Sper. Agr. Ital., 44 (1911), No. 1, pp. 5–10*).—Previously noted from another source (E. S. R., 25, p. 614).

A rapid volumetric method for the estimation of free sulphur, C. DAVIS and J. L. FOUCAR (*Jour. Soc. Chem. Indus., 31 (1912), No. 3, p. 100*).—The method is as follows:

"One gm. of the finely ground (60 mesh) sample (or its equivalent if previously dried) is dried in the water bath for an hour (if not already dried) and then transferred to a 250-cc. flask; 1.5 gm. of sodium cyanid and 50 cc. of absolute alcohol are added, and the contents are boiled under a reflux condenser for 2 hours. The alcohol is then completely removed by distillation, 100 cc. of hot water added, and the solution washed into a 250-cc. flask. The volume is made up to the mark—in the cold. To 25 cc. of this solution 75 cc. of water and 5 cc. of saturated iron alum solution are added; this is heated with constant stirring to 95° C., filtered into a 750-cc. beaker, and washed free from thiocyanate. When cool, 5 cc. of nitric acid is added, the solution made up, if necessary, to about 500 cc. with water, and titrated with twentieth-normal silver nitrate solution until the red color of the ferric thiocyanate completely disappears, or an excess of silver nitrate may be added and the solution titrated back with twentieth-normal thiocyanate. Should the sample contain thiocyanate, as is most likely in the case of spent oxid, a blank test should be conducted, the thiocyanate being extracted with water.

"Should it be required to ascertain the amount of matter, other than sulphur, soluble in carbon bisulphid, it may be determined by subtracting the sulphur content, found as above, from the figure obtained in the usual way for the percentage soluble in carbon bisulphid."

Detection of fluorids, E. RUPP (*Ztschr. Untersuch. Nahr. u. Genussmtl., 22 (1911), No. 9, pp. 496, 497, fig. 1; abs. in Analyst, 37 (1912), No. 430, p. 32*).—The substance to be tested is converted into ash and moistened in a platinum or lead crucible with 3 drops of water and 1 cc. of sulphuric acid. The crucible is then pitted loosely with a rubber stopper, through which a piece of glass rod passes. The lower end of the glass rod is moistened with a drop of water and the crucible with its contents heated for about 20 minutes.

If fluorids are present the rod becomes coated with a film consisting of silica, sodium silicofluorid, and calcium silicofluorid. If only traces of fluorid are suspected the portion of the glass rod below the stopper may be covered with a piece of rubber tubing, leaving only the end exposed to the action of the vapors.

Work published in regard to the composition, analysis, and adulteration of foods, A. J. J. VANDEVELDE (*Répert. Internat. Comp., Anal. et Falsif. Denrées Aliment., 10 (1909), pp. 104*).—This is a bibliography, which in some instances

includes abstracts, embracing the following topics: Foods and methods of food analysis, apparatus, water, milk and cream, fats and oils, cheese, flour and its derivatives, spices, sugars, beverages, legumes, fruits, meats, eggs, food adulteration, food legislation, etc.

Compendium for food chemists, A. BUJARD and E. BAIER (*Hilfsbuch für Nahrungsmittelchemiker. Berlin, 1911, 3. ed., rev., pp. XVIII+730, figs. 10*).—This publication (E. S. R., 12, p. 676) has been enlarged and brought up to date.

Netherland food codex, A. J. J. VANDEVELDE (*Rev. Gén. Chim., 14 (1911), Nos. 17, pp. 269–277; 18, pp. 291–297*).—A description of the official methods, chemical, microscopical, and physical, for the examination of the various flours and breads.

The valuation of edible fats by color reactions, H. SERGER (*Chem. Ztg., 35 (1911), Nos. 65, pp. 581, 582; 67, pp. 602, 603; 68, pp. 610–612*).—This is a discussion in regard to the various color reactions thus far proposed for detecting adulterations in the edible fats. It is divided into a general part, which considers the Welman, Bellier, Serger, Kreis, and Wiedmann reactions, and a special part, which deals with specific reactions and considers cotton-seed oil (the Halphen, Becchi, and Hauchecorn reactions), olive oil, lemon oil, palm oil, coconut oil, peanut oil, and sesame oil. The reaction of sesame oil in butter has already been noted (E. S. R., 26, p. 212).

Examination of diseased potatoes with Reimann's potato balance, S. HALS (*Tidsskr. Norske Landbr., 18 (1911), p. 183; abs. in Chem. Ztg., 35 (1911), No. 91, Repert., p. 384*).—Eighteen samples of potatoes which were affected with rot showed an average of 2.4 per cent less dry substance when determined by Reimann's balance than the figures obtained by the usual gravimetric method. The starch content in 9 out of 10 cases also showed 3 per cent less with the Reimann apparatus. These differences are probably due to the fact that the brown portions of the diseased potato contain proportionately less starch and more air spaces, so that their buoyancy in water becomes greater.

An electrical conductivity test for purity of maple sirup, J. F. SNELL (*Abs. in Science, n. ser., 35 (1912), No. 897, p. 379*).—The method consists of diluting the sirup with 2 volumes of water and determining its electrical conductivity with the usual Wheatstone bridge and telephone receiver.

Among 57 sirups coming from Quebec, Vermont, and Ontario only 2 samples which were not obtained from the market gave conductivity figures under 200. The smallest value found was 110. Genuine sirups from the United States may be expected to give figures varying from 100 to 200, and Canadian sirups from 120 to 200.

Official methods for the examination of chocolate and cocoa (*Ann. Falsif., 4 (1911), No. 34, pp. 417–427, figs. 5*).—These are the official French methods for determining water, ash, fat, sugar, matter insoluble in water, and starch in ordinary chocolates and cocoas, and the ash, casein, saccharose, lactose, etc., in milk chocolate. Some microscopic methods are included.

Detection of caramel in fermented beverages, V. PASQUERO and A. CAPPA (*Gaz. Chim. Ital., 41 (1911), II, No. 3, pp. 349–358; abs. in Analyst, 37 (1912), No. 430, p. 18*).—The method rests on the fact that furfurol can be obtained when caramel is subjected to distillation. The test is conducted as follows:

The beer, or other beverage suspected of containing caramel, is first neutralized with magnesium carbonate, and 100 cc. is distilled (after adding a few pieces of pumice stone) until a bulk of distillate corresponding to 75 cc. is obtained. The distillate is then made up to 100 cc., and 20 cc. shaken with 2 cc. of glacial acetic acid and 5 drops of colorless anilin in a colorimetric tube. If caramel is present a red color is produced within 15 minutes.

Analysis of candied lemon peel, F. Härtel and A. Kirchner (*Ztschr. Untersuch. Nahr. u. Genussmtl., 22 (1911), No. 6, pp. 350–353; abs. in Analyst, 37 (1912), No. 430, pp. 20, 21*).—Twenty samples of candied lemon peel were examined with the following results: "Insoluble substances, 2.89 to 5.22 per cent; soluble extractives, 60.83 to 79.22 per cent; acidity (as citric acid), 0.04 to 0.2 per cent; sucrose, 14.3 to 48.5 per cent; starch sirup (anhydrous), 9.45 to 25.3 per cent; ash, 0.37 to 3.09 per cent; sodium chlorid, 0.02 to 0.69 per cent.

The process of manufacturing candied lemon peel is described.

Technical drug studies by the division of drugs (*U. S. Dept. Agr., Bur. Chem. Bul. 150, pp. 51*).—The following studies are included in this publication: Examination of Hydrogen Dioxid Solutions, by L. F. Kebler, L. E. Warren, and E. A. Ruddiman (pp. 5–23); The Purity of Glycerin, by L. F. Kebler and H. C. Fuller (pp. 24–35); Notes on Two Important Alkaloidal Reactions, by H. C. Fuller (pp. 36–40); The Separation and Identification of Small Quantities of Cocain, by H. C. Fuller (pp. 41–44); The Determination of Molybdic Trioxid, by B. Herstein (pp. 44–46); A Method for Testing Ammonium Salts, by B. Herstein (pp. 47, 48); Character of Samples of Beeswax Submitted with Bids, by L. F. Kebler and F. M. Boyles (pp. 49–51).

Biochemistry of colostrum, S. Engel (*Ergeb. Physiol., 11 (1911), pp. 41–103, figs. 8*).—This is a critical review of practically all the work done in regard to the biochemistry of colostrum. It includes the colostrum of the cow, buffalo, goat, sheep, horse, and man.

Investigations in regard to the hemolytic power of cow's colostrum, W. Köbele (*Centbl. Bakt. [etc.], 1. Abt., Orig., 61 (1912), No. 7, pp. 561–589*).—The colostrum from some cows contains hemolytic amboceptor and complement. Hemolytic amboceptor is present the second day post partum. Indications for complement were noted up to the fifth day, but most often only to the third day.

According to this author, the hemolytic amboceptors and complement in colostrum are nothing else than constituents of the normal bovine serum which have filtered through the blood vessels into the mammary gland. These bodies are present in both the initial and end colostrum, and in practically the same amounts.

Note on the gravimetric estimation of phosphorus in milk, E. H. Miller (*Analyst, 36 (1911), No. 429, pp. 579–583*).—"The conclusions drawn from the results are that the usual methods of estimating phosphorus in milk—viz, (1) By precipitating as magnesium ammonium phosphate after removing the lime as oxalate, and weighing as magnesium pyrophosphate; (2) by precipitating as magnesium ammonium phosphate in the presence of lime, holding the same in solution with ammonium citrate, and weighing as magnesium pyrophosphate; and (3) by precipitating as ammonium phosphomolybdate, dissolving and reprecipitating as magnesium ammonium phosphate, and weighing as magnesium pyrophosphate—give results that differ from Carius's method only by about 0.01 per cent. In the case of concentrated and sweetened condensed milk and milk powders it is evident, however, that it is preferable to treat the milk solids by Carius's method, and estimate the orthophosphoric acid in the solutions so obtained. It might be mentioned that the close agreement between the results seems to show that no appreciable quantity of phosphorus is volatilized during the incineration of the milk. This has also been pointed out by Bordas and Touplain" (E. S. R., 25, p. 713).

Comparison of methods of sampling cream for testing, C. E. Lee and N. W. Hepburn (*Illinois Sta. Bul. 153, pp. 543–574*).—The purpose of this investiga-

tion was principally to determine the efficiency of the various methods of sampling in use and their relation to actual creamery practice.

The kinds of samples taken were individual, ordinary composite (obtaining a sample consisting of a representative amount of cream from each delivery of a single patron for 15 days), and proportionate (samples taken in proportion to the amount of cream received at the creamery). For the whole experiment 40 per cent 18 gm. bottles, graduated to ½ per cent, were used. The samples were weighed on a scale of the creamery torsion type.

The duplicates obtained when testing the cream by the same or different testers were only reasonably variable. "In samples reported 87.7 per cent were exact duplicates or checked within ½ per cent, 9.8 per cent varied 1 per cent from the individual, while 2½ per cent showed a variation of more than 1 per cent." A greater latitude of variation between composite and individual samples was noted than between 2 sets of composites. The variation, however, was evenly divided. The composites of one of the authors (Hepburn) showed tests of 36.4 per cent above and 41.99 per cent below the individual samples.

"Two series of composites taken in the same manner showed the following tendency for variation: 63.73 per cent were exact duplicates, or varied but ½ per cent; 17.6 per cent varied 1 per cent; 6.33 per cent varied 1.5 per cent; 7.52 varied 2 per cent; 2.1 per cent varied 2.5 per cent; while 2.8 per cent varied more than 2.5 per cent. During the winter months 41.87 per cent of the composites tested lower than the individual against 35.38 per cent testing higher. During the summer months 33.91 per cent tested lower against 43.16 testing higher."

The results of long-time averages, that is, during a period of 6 months, show that one of the testers (Lee) had only 15.7 per cent of the samples vary more than ½ per cent, while with the other tester (Hepburn) the variation was 15.9 per cent. "Under the proportionate system, for a period of 6 months, 24.75 per cent of the samples varied more than ½ per cent." When based on the period of 1 year "only 5.95 per cent of Lee samples varied more than ½ per cent, while during the same length of time 7.78 per cent of Hepburn's varied more than ½ per cent. Results from the yearly average butter fat show 14.52 per cent of composites below the individual and 7.7 above by Lee, and by Hepburn 15.34 per cent below and 7.78 above. These results are closer than the results obtained by duplicate testing."

All of the above results were corroborated from the total weights of butter fat, which showed that the variation between the individual and composite samples was 0.27 (Lee samples) and 0.16 (Hepburn samples) per cent. According to these findings, reasonable allowances should be made for the differences in duplicate samples obtained by the same or different testers.

The aldehyde figure of butter, E. H. Miller (*Analyst, 37 (1912), No. 431, pp. 50, 51*).—Formaldehyde combines with milk proteins to form additive compounds, probably of the type $R<\begin{matrix}NCH_2\\COOH\end{matrix}$, which increase the acidity of the milk or cream in proportion to the total nitrogen present. This fact has been employed successfully by Richmond (E. S. R., 18, p. 8; 22, p. 309) for estimating the proteins in milk, and the author sought to apply it to the protein content of butter. The results obtained with butter 1 month old show that it can be employed for this purpose.

The method used in the investigation was as follows: "Approximately 10 gm. of butter is weighed into a tared beaker, which is placed in a water bath at 60 to 70° C., until the butter is completely melted. Twenty-five cc. of water at about 65° is added, and followed by 1 cc. of a 0.5 per cent solution of phenolphthalein. The contents are well agitated. Approximately twentieth-

normal alkali is then run in until a faint permanent pink tint is formed. If it is found that the end point is masked by the yellow color of the butter fat, the contents of the beaker should be allowed to settle, and the bottom aqueous layer observed, and the addition of alkali continued until the pink tint is obtained. Five cc. of strong formaldehyde solution is next added, and the contents of the beaker well agitated; twentieth-normal strontia is then run in until the pink tint is again produced in the aqueous portion.

"The number of cubic centimeters of twentieth-normal alkali used in the second titration, less the amount equivalent to the acidity of the formaldehyde solution added, is proportional to the protein present. One cc. of twentieth-normal strontia is equivalent to 0.01355 gm. of protein nitrogen, assuming the proportion of casein to albumin to be 7:1."

Procedure for determining the sugar content of bagasse, J. J. HAZEWINKEL, J. S. DEHAAN, and G. L. VAN WELIE (*Arch. Suikerindus. Nederland. Indië, 19 (1911), No. 49, pp. 1687–1691; Meded. Proefstat. Java-Suikerindus., 1911, No. 13, pp. 381–385; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 3, pp. 142, 143*).—This is a method based on the fact that proper results can only be obtained if the basic lead acetate solution is added after boiling. Defecation before boiling yields higher results.

In regard to the changes which take place in sugar beets during storage, G. FRIEDL (*Kisérlet. Közlem., 14 (1911), No. 6, pp. 793–819*).—The losses of sugar in beets during storage are due in part to the absorption of large amounts of water, which dilute the juice, but mainly to the consumption of saccharose by the respiratory process of the beet. This latter loss, however, can not be prevented unless the vital processes of the beet are checked or destroyed, and this can only be accomplished by impracticable methods as freezing or drying the beet. Invert sugar was found to be the intermediary product of saccharose destruction. The energy of respiration is dependent upon various factors. The nitrogen content of the beet was found to be more stable than the saccharose, and only at the end of the storage period was there a perceptible cleavage of protein. Of the cleavage products glutamin was formed to the greatest extent. No transformation of glutamin to glutaminic acid was noted.

The comparative influence of water and vinasse upon the pulp residues obtained from the manufacture of beet sugar and from the distillery, L. AMMANN (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 6, pp. 366–369*).—The pulp obtained from the sugar-beet distillery is considered superior as a feed to that obtained from the beet-sugar refinery. This, however, is not regarded as due to the apparatus employed for the extraction of the sugar, but rather to the liquid which is utilized for extracting the sugar.

The desiccation of potatoes and the uses of the product, C. C. MOORE (*Abs. in Science, n. ser., 35 (1912), No. 897, p. 380*).—"The desiccation of potatoes has been commercially developed in Germany, but the product has not been suitable for the manufacture of starch. Investigations have shown that a dried potato product can be prepared in a way suitable for starch manufacture. Owing to the greater degree of fineness to which the dried product can be reduced, over 90 per cent of the starch can be separated in the usual washing and decantation methods, as against a recovery of 65 to 75 per cent of starch when potatoes are ground in a fresh state."

Forest chemistry, 1909–10, P. SINGH (*Ann. Rpt. Bd. Sci. Advice India, 1909–10, pp. 26–30*).—This is a report of the work done by the assistant chemist of the Imperial Forest Research Institute of India, including the manufacture of mangrove tannin extract from *Rhizophora mucronata*, distillation of *Blumea balsamifera* and Rhusa grass oil, manufacture of shellac, analysis of shellac, turpentine, colophony, *Canarium bengalense*, and camphor from *Cinnamomum glanduliferum*, and the refining of Koosam oil for soap making.

METEOROLOGY—WATER.

The climate of Ohio, J. W. SMITH (*Ohio Sta. Bul. 235, pp. 185–209, figs. 15*).—The available records on temperature, precipitation, humidity, sunshine, first and last frosts, and wind movement are summarized in tables and charts.

It is shown that the average annual temperature for Ohio during the period from 1883 to 1910, inclusive, was 50.7° F. July is shown to be the warmest month, with an average temperature of 73.1°; January the coldest month, with a mean temperature of 27.7° F. At some time during this period the temperature went below zero in each month from November to March, inclusive, and below freezing in every month in the year except July. The average annual precipitation for the State as a whole during the period from 1854 to 1910, inclusive, was 38.89 in. June has shown the greatest average rainfall, with 4.13 in.; October the least, with an average of 2.52 in. "The snowfall averages less than 20 in. in the extreme southern portion of Ohio, and over 60 in. in northeastern counties. The prevailing winds are from the southwest over most of the State, and vary slightly with the season." The average number of rainy days is 122.

"Ohio is in the path of a large part of the general low pressure or storm areas which move across the United States from west to east. These areas move at an average speed of 600 miles in 24 hours and are preceded by southerly winds and higher temperature and followed by northerly winds and lower temperature. They are usually accompanied by cloudy weather and precipitation and each storm causes an average of from one to two rainy days at each place as they pass. . . .

"As there is an average of two of these storm areas each week with fair weather periods between them, it follows that the change in weather conditions is rather rapid. One or two days of stormy weather preceded by higher and followed by lower temperatures, succeeded by one or two days of fair weather preceded by lower and followed by higher temperatures, to be repeated in turn, makes up the usual routine for the week.

"Yet Ohio is far enough from the coast so that the damaging Gulf and Atlantic storms lose very much of their severity before reaching [the State]. The northwestern cold waves pass across the State with sufficient intensity to ventilate and invigorate the towns and cities and send their health-giving winds into all parts of the State, and yet the cold waves are not so severe in Ohio as in corresponding latitudes in the Mississippi and Missouri valleys."

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and R. N. HALLOWELL (*Massachusetts Sta. Met. Buls. 279, 280, pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during March and April, 1912. The data are briefly discussed in general notes on the weather of each month.

The weather of 1911 at the Midland Agricultural and Dairy College, Kingston-on-Soar, Notts, F. WAKERLEY (*Midland Agr. and Dairy Col. Bul. 7, 1911–12, pp. 61–66, figs. 2*).—The record of air and soil temperature, rainfall, frosts, and other weather conditions for 1911 is compared with those of the previous 6 years.

This shows that at this institution, which is situated at Kingston-on-Soar, Nottinghamshire, the mean temperature was 49.6° F., a little above the average; the maximum, 95.3° (on August 8), the highest on record; and the minimum, 14.2°, on February 1. The annual rainfall, 18.01 in., was much below the average of 25 in. The number of rainy days was 156 as against 204 the previous year.

Report of the work of the station of agricultural climatology of Juvisy during 1910, C. FLAMMARION (*Bul. Mens. Off. Renseig. Agr. [Paris], 11 (1912)*,

No. 4, pp. 460–477, figs. 7).—This includes the usual summaries of observations on temperature of the air, soil, and underground water, atmospheric pressure, humidity, rainfall, sunshine and cloudiness, and wind. There is also a brief discussion of the late summer and warm autumn characteristics of the climate of the region, as illustrated by conditions during the summer and fall from 1906 to 1910. The season of 1910 was wet, cold, and very unfavorable to crops.

Weather forecasts for 1912 in Russia, I. Savizkii (*Selsk. Khoz., 1912, No. 10, pp. 462–464; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 5, pp. 1097, 1098*).—The success of long-time weather predictions in Russia is discussed. It is stated that the propitious weather of the season of 1909 was predicted 3 months before harvest, the drought of 1911 in September, 1910. The predictions for 1912 are given in some detail.

Our weather, J. S. Fowler and W. Marriott (*London, 1912, pp. XI+131; rev. in Nature [London], 89 (1912), No. 2220, p. 267*).—This is one of a series of elementary books. After a brief introductory chapter explaining the practical need of a popular book on the weather, there follow chapters on pressure, temperature, humidity, wind, and allied phenomena, as well as on weather forecasting, the upper air, phenological observations, and weather proverbs and rhymes.

Smoke.—A study of town air, J. B. Cohen and A. G. Ruston (*London, 1912, pp. 86, figs. 35*).—This book, the more important agricultural features of which have already been noted from another source (E. S. R., 26, p. 727), deals with (1) solid products of combustion, (2) gaseous impurities, (3) town fog, (4) dispersal of soot, (5) influence of coal smoke upon health, (6) analysis and manuring value of soot, (7) analyses of Leeds rain water, and (8) sootfall of London.

Combined nitrogen in rain, C. T. Gimingham (*Chem. World, 1 (1912), No. 5, pp. 155, 156*).—The various observations on this subject are summarized, the general conclusion being "that in rural districts the soil receives annually something between 5 and 6 lbs. of nitrogen per acre in the rain; and this, though a small amount, is by no means negligible in experimental work."

Ponds in agricultural districts, E. A. Martin (*Jour. Bd. Agr. [London], 19 (1912), No. 1, pp. 17–20*).—The making and care of ponds for storage of water in time of drought are briefly discussed. It is shown that under the conditions prevailing in parts of England upland ponds dry up less rapidly than lowland ponds.

Sewage disposal, G. W. Fuller (*New York and London, 1912, pp. XV+767, figs. 80*).—This book records recent advances and gives the present status of both theory and practice in the field of sewage disposal. It deals essentially with American practice, particularly as observed in the author's experience, although European practice is not entirely ignored. The subject is treated from the viewpoint mainly of the operator of disposal works.

"The book is divided into 4 parts of approximately equal size. The first part is devoted to a somewhat lengthy description of the composition of sewage and the behavior of bacterial and biochemical processes in the decomposition of sewage. The importance of oxygen and deoxygenation, not only as a means of measuring the strength of sewage but in relation to proper conditions of the flow of sewage through collecting systems and various disposal devices, is discussed rather fully. The practical purpose of this is to show how to prevent or lessen 'putrefaction' with its objectionable odors. The significance of sewage disposal problems from various angles is explained in detail. In particular the relation of sewage bacteria to shellfish pollution is discussed with thoroughness at a time when this problem is being actively considered by federal

and state authorities, who differ from the oyster growers in their views on several points.

"The second part of the book is devoted to a recital of American experience in the disposal of sewage by dilution in inland streams, lakes, tidal estuaries, and oceans. Although several early American reports upon this subject were prepared with much thoroughness, they have not received the attention in recent years that they are entitled to. The prevailing method in America of disposing of sewage by dilution has been applied in a faulty way in many instances, and corrective measures are needed. It is not necessary, however, in a majority of cases, to abandon this method in favor of complete purification. The limiting factors and conditions in present practice are described at length, with suitable summaries.

"The third part of this book deals with what have been generally called preparatory arrangements for the treatment of sewage. Screening, settling tanks, septic tanks, chemical precipitation tanks, electrolytic treatment, and strainers are discussed in much detail, particularly septicization in two-story tanks. Résumés as to their present standing are given for each device.

"The fourth part deals with filtration matters with a view to recording present practice. The closing pages of the book are devoted to aeration, sterilization, and ozonization processes as they are now understood, with a few explanations as to institutional and residential plants, and a final comparative summary of general costs and efficiencies."

The chapter on broad irrigation is of special interest from an agricultural standpoint. In a résumé of this chapter it is stated that "in America broad irrigation or sewage farming is not practiced to-day even in the arid regions so as to give satisfactory results for the sanitary disposal of sewage. There may be scattering exceptions to this statement, but an examination of the present facts does not bear out earlier reports that broad irrigation is really used regularly and carefully in numerous places.

"Objections to the method have increased rather than decreased in recent years. These relate to objectionable odors, prejudices against the use of sewage in growing vegetables, and to the transmission of disease germs by flies and other insects.

"Experience shows that only nominal aid financially has been received from the use of sewage in broad irrigation.

"The present outlook is that broad irrigation or sewage farming is decidedly on the wane with little prospects of adoption even in the arid districts except perhaps for an occasional project where local conditions are unusually favorable."

Practical methods of sewage disposal, H. N. Ogden and H. B. Cleveland (*New York and London, 1912, pp. VI+132, pl. 1, figs. 51; rev. in Engin. News, 67 (1912), No. 24, p. 1157*).—This book explains the increasing need for more efficient means of sewage disposal in country homes and rural communities. It deals with the individual system as distinguished from the community or municipal plan of disposal. "The higher standards of living which have made themselves felt throughout the rural community have demanded in farmhouses and country homes sanitary conveniences which have hitherto been wanting.

"Gradually every house is using more and more water for various purposes, and living conditions, which in the past tolerated a scanty supply drawn from a pump, are no longer endured. The increased water supply and the demands of extended plumbing mean a greater amount of sewage—so great an amount that, in many cases, soils which could receive and digest the waste waters

from houses supplied by wells are clogged and made impervious by this greater amount.

"Further, the danger to wells from the infiltration of cesspools is more feared, and it is understood as never before that in order to maintain the highest degree of health in a family the drinking water used must be above suspicion and not subject to contaminating influences in the vicinity.

"Again, communities are being aroused to the intrinsic value of maintaining streams in a pure condition—partly because of the value of fish and ice coming from the streams themselves, and partly on the broad ground that water courses belong to the country as a whole, and must be kept pure for the sake of succeeding generations, not spoiled for them on account of the selfishness of a few at the present time.

"Thus it is that to-day the problem of sewage disposal, while arousing general interest, is recognized as one which requires more than the common sense of an average person, that the force and principles involved are understood to be not those in common use, and that, for successful disposal of sewage, special knowledge and judgment are required."

The book divides sewage purification into two processes, (1) preliminary sedimentation, as for example, by means of the Imhoff or Ems tank, and (2) final disposal by subirrigation, sand filter, contact bed, or sprinkling filter. The sprinkling filter system is considered more complicated, and less suitable for this reason, than the others.

The merits and faults of broad irrigation as a method of disposing of sewage are quite fully set forth. With suitable soil and slope, and proper care, this method is deemed efficient and productive of increased crops, but it requires watchful care and much labor to prevent offense and danger to health.

The design, construction, and cost of the sewage systems are presented in text, tables, and sketches.

SOILS—FERTILIZERS.

Present problems in soil physics as related to plant activities, B. E. LIVINGSTON (*Amer. Nat., 46 (1912), No. 545, pp. 294–301*).—In this paper, which was presented in the symposium on problems of the soil at the Washington meeting of the American Association for the Advancement of Science, the author considers the soil moisture relations of the underground parts of the plant to plant activities. The following summary is given:

"The soil water relation is of fundamental importance if we are some time to know about and be able to predict and control plant processes. The moisture of the soil, as well as its other features, is most profitably to be studied as plant environment, the relations which obtain between plant activity and soil phenomena comprising a fundamental and primary requirement for the scientific advance of our knowledge. The physical nature of the subterranean environment of terrestrial plants is effective in controlling plant activities, mainly with regard to the possible rate of delivery of water by the soil to unit area of absorbing roots. It is highly desirable to study this power of water delivery with reference not only to the growth of plants, but also to other soil characteristics, some of which are already commonly measured. The whole problem of the physics of the subterranean surroundings of rooted plants awaits the development of an instrumentation which will not necessitate the preliminary destruction of some of the most important soil properties before the soil can really be studied."

The temperature of the soil under different conditions, W. R. DUNLOP (*Agr. News [Barbados], 11 (1912), No. 261, p. 135*).—Observations on temperature of

different soils in dry and in wet localities, and as influenced by depth, color and texture, fertilizers, and cultivation, are reported.

Soils in a wet locality maintained a lower temperature than those in a dry locality. This is attributed to the cooling effect of the rainfall with its subsequent evaporation, to direct sea breezes, and to the absorption of radiant heat by clouds.

The temperature of the soil at 3 in., at 6 a. m., was 72° F. and increased to a maximum of 91° at 1 p. m. There was a quick drop after sunset. The temperature at 6 in. remained more constant, and was lower during the day than at 3 in. but higher at night. "At a depth of 1 ft., the temperature remained nearly constant during the day, but it was 2° lower at night than during the day. The maximum temperature was 85°. At a depth of 2 ft., the temperature was 83°, and remained constant day and night. A heavy shower of rain lowered the temperature by 1° on another occasion. . . .

"The sand plat was warmer at 1 p. m. than the soils of the other plats, and was cooler at 7 a. m. The temperature of the untouched sand at 1 p. m. was 99°; that of the cultivated sand 90°. The temperature of the dry sand had a diurnal range of 26°; this was considerably greater than that of the air. In the case of all the plats, the effect of water in leveling up the specific heats was clearly indicated. At 1 p. m. the clay was warmer than the humus plat, but cooler at 7 a. m. The lime plat (untouched) was 13° cooler at 1 p. m. than the sand plat (untouched), and the lime plat also possessed the lowest diurnal range, which amounted to 6 to 8°."

Cultivating, particularly forking and plowing, had a cooling effect. "Rolling warmed the soil in dry weather, but had the opposite effect when the land was wet. As regards ridging or banking up, the important fact was brought out that land cultivated in this manner from east to west is at least 3° warmer during the day than when the soil is ridged north and south. At a depth of 3 in. the difference would be at least 6°. The well-known fact that wind cools the soil was also supported by observations made in sheltered and unsheltered places. The soil under pasture was rather cooler than arable soil, and covering arable soil with light trash lowered the temperature during the day by 4°." Soil shaded with cacao plants was 11° cooler at 1 p. m. than soil exposed to the sun, and at 7 a. m. it was cooler by 3°.

Studies of the heat conductivity of some soil types, H. Karsten (*Internat. Mitt. Bodenk., 1 (1912), No. 6, pp. 524–543, figs. 4*).—Studies of the theory of heat transference in masses of spherical bodies, and determinations of the same in soils of different structure and moisture content, are reported, using a modification of the Christiansen apparatus. The theory that the heat conductivity of spherical, homogeneous bodies of the same size is independent of the length of their radii was substantiated. The heat transference was influenced by the structure and particularly by the moisture content of the soil.

Suspensions and the phenomena of absorption, S. Arrhenius (*Rev. Sci. [Paris], 49 (1911), I, No. 15, pp. 449–456*).—This is a mathematical discussion of the laws and phenomena of absorption in solutions, based on investigations by different authors.

The plant and the salts of the soil, N. M. Tulaikov (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 13 (1912), No. 1, pp. 27–53, figs. 4; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 6, p. 1297*).—It is stated as a result of studies that the water-soluble nonnutrient salts of the soil had a decided influence on the growth of vegetation, both in its earliest and in its last stages of development.

In the earliest stages of growth the action of the salts was physical, in that it brought about a certain degree of osmotic pressure and thereby regulated

the absorption of water by the germinating seeds. Individual peculiarities of the salts were only slightly discernible, and isotonic solutions of different salts produced very similar effects. The toxicity of the different salts to plants as a rule manifested itself in plasmolysis of the contents of the root cells. In some cases the salts seemed to have a chemical action, destroying the structure or coagulating the contents of the surface cells of the roots.

Variations in the content of nonnutrient salts in the soil solutions were clearly reflected in the character of the growth of the plants and in the yield, there being in solutions of high concentration and osmotic pressure quicker changes in phases of growth, a reduction in total yield and yield of grain, and, on the other hand, a marked increase in the amount of nitrogenous substances in the plant and particularly in the amount of albumin in the grain (of wheat). The effect of the osmotic pressure of the soil solution on the production of nitrogen in the wheat grain was especially marked during the period of filling and ripening of the kernels.

The biological absorption of phosphoric acid in the soil, A. I. DUSHECHKIN (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 12 (1911), No. 5, pp. 650–668; abs. in Zentbl. Agr. Chem., 41 (1912), No. 5, pp. 305, 306; Jour. Chem. Soc. [London], 102 (1912), No. 597, II, p. 677*).—Studies of the biological absorption of phosphoric acid from solutions in soils receiving starch and treated with thymol and with chloroform are reported. Tests of the influence of sodium nitrate on the biological absorption were also made.

From the results of these studies it is concluded that in addition to the physico-chemical absorption of phosphoric acid there was a biological absorption. The latter increased with the starch content of the soil and also with the length of time. It was more pronounced with the larger applications of phosphoric acid. The fixation of phosphoric acid by the micro-organisms took place not only from the readily soluble forms but from the difficultly soluble phosphoric acid of the soil as well, and was stimulated by additions of sodium nitrate. Bacterial fixation of phosphoric acid was accompanied by a dissolving process.

The origin of loess, C. L. HENNING (*Internat. Mitt. Bodenk., 1 (1912), No. 6, pp. 518–523*).—Different theories regarding the origin of loess deposits are stated, and the American literature is briefly reviewed with particular reference to the work of E. E. Free of the Bureau of Soils (E. S. R., 25, p. 424).

Soil fertility, C. G. HOPKINS (*Illinois Sta. Circ. 157, pp. 16*).—This is an address delivered before the Illinois State Farmers' Institute in which the author discussed the more important methods and results of Illinois soil investigations which support the conclusion "that for the most economic and profitable systems of permanent agriculture in general farming, we should make large use of natural materials including for normal soils ground limestone, raw rock phosphate, and organic matter to be supplied by plowing under legume crops and other crop residues, either directly or in farm manure."

Cooperative study of Rhode Island soil deficiencies, H. J. WHEELER ET AL. (*Rhode Island Sta. Bul. 149, pp. 47–79, pls. 2*).—Accounts are given of experiments begun in 1890 on a number of farms in different parts of the State with a view of determining their lime and fertilizer requirements. The results have previously been reported in large part in bulletins and reports of the station (E. S. R., 15, p. 665; 19, p. 317; 23, p. 21).

Soil mapping and soil analyses, D. J. HISSINK (*Cultura, 24 (1912), Nos. 283, pp. 128–132; 284, pp. 158–163*).—This is a summary of the work of Hall and Russell with reference to the soils of southeast England (E. S. R., 26, pp. 118, 119), and is offered as a criterion by which to determine the expediency of conducting agricultural soil surveys in the Netherlands.

Investigations on pine-covered sand dune soils, K. Vogel (*Internat. Mitt. Bodenk., 1 (1912), No. 6, pp. 495–517, pls. 3*).—The pine forests of Melchow near Eberswalde having shown a marked difference in productiveness, the author made a series of mechanical and chemical analyses of samples of soil from areas supporting a vigorous forest growth and from devastated areas, parts of which had been reforested, with a view of determining the limiting element of plant food. A comparison was made of the results of these analyses with those of forest soils by other investigators.

The results showed that these sand dune soils were low in mineral constituents but that, notwithstanding this fact, they produced heavy crops of pine trees where sufficient amounts of nitrogen and humus were present in the soil. The yield of pine trees was in direct proportion to the nitrogen and humus content of the soil, and it is believed, therefore, that for the improvement of these dunes, and probably also of most of the forest soils of northern Germany, which have been shown to contain at least an equally high mineral content, the application of mineral fertilizers is not necessary but that consideration should be given to the matter of increasing and conserving the nitrogen and humus content of the soil.

Studies of the tillable soils of Roumania, G. Murgoci (*Internat. Mitt. Bodenk., 1 (1912), No. 6, pp. 544–562*).—References to the more important literature on the subject are given, with a brief discussion as to the scope of the different works.

The composition of sandy soils of Tripoli, A. Menozzi (*Agr. Mod., 18 (1912), No. 6, pp. 81–83*).—The results of mechanical and chemical analyses of soil samples from different parts of Tripoli and from Sfax in Tunis, including tests of the absorption of ammonia and phosphoric acid from solutions, are reported and briefly discussed.

Some cotton soils of the Nyasaland and Uganda protectorates (*Bul. Imp. Inst. [So. Kensington], 10 (1912), No. 1, pp. 55–74*).—The results of mechanical and chemical analyses of a number of samples of typical soils from different parts of the regions to determine their suitability for cotton growing are reported and briefly discussed. The soils, in general, contained sufficient amounts of plant-food constituents. In some cases, however, the percentage of nitrogen and of phosphoric acid was slightly below the average for good cotton soils. The mechanical condition of the soils was satisfactory.

The pinery and orchard soils of the Bathurst Division, Cape Province, J. Lewis (*Agr. Jour. Union So. Africa, 3 (1912), No. 3, pp. 357–371*).—The pineapple crops of the region having shown a steady deterioration, the author made a series of analyses of typical soils and of average fruit and plants with a view of determining their plant-food requirements. Analyses of apple and orange soils were also made.

The results, in general, showed that, although the soils may be considered of medium quality, the pineries were in every case deficient in one or more of the necessary soil constituents. The use of ordinary mineral fertilizers is recommended to supply the deficiency. The apple and orange soils were generally poor in lime, potash, and phosphoric acid, and a few were also poor in nitrogen.

[Analyses and determinations of moisture of Queensland soils], J. C. Brünnich (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1909–10, pp. 44, 50–56*).—Analyses of soils of newly opened banana and pineapple districts calculated to pounds of plant food per acre for a depth of 1 ft., and determinations of soil moisture at various depths and in relation to cultivation are reported.

The soils, in general, were well supplied with the mineral constituents of plant food. It is stated that the value of the soil analyses would be very much

increased by more complete data as to the origin of the soils, and the starting of detailed soil surveys by districts has therefore been recommended.

The results of the moisture determinations show "that in the uncultivated block very little of the water which fell during December and January was absorbed by the soil, and that in spite of the good rain the amount of moisture remained practically the same at the various depths of 6 in., 1 ft. 6 in., 2 ft. 6 in., and 3 ft. 6 in. during the months of December, January, and February. Very heavy rain fell before the March sample was taken, and the soil from the top layer right down to 3 ft. 6 in. benefited by this rain, but the moisture again was very rapidly lost after a few weeks without rain. In the cultivated land the conditions of absorbing moisture were more favorable, and again the loss of moisture by evaporation was considerably diminished. Very striking, however, is the difference caused by the Campbell system of cultivation and also in the land worked bare fallow, which cause the moisture to be completely conserved in the top layers, and almost completely prevented the loss by evaporation during months of dry weather."

Fertilizers and crops, L. L. VAN SLYKE (*New York and London, 1912, pp. XIV+734, pl. 1, figs. 132*).—This book, by the chemist of the New York State Station, attempts to make "practical application of the results of investigation to the use of plant food in the growing of crops." It embodies the main results of investigation in this country and abroad, including the author's studies, observations, and experience in this field during the past 25 years.

"The purpose has been not merely to give information but to present it in such a systematic way as to show certain fundamental relations and make clear, as far as possible, the reasons underlying every practice suggested. . . .

"In the selection and arrangement of the materials, the writer has kept in mind the needs of practical farmers as well as those of classes in agricultural colleges and high schools."

The book is divided into 4 parts, part 1 (pp. 1–233) dealing with factors of soil fertility, part 2 (pp. 235–393) with sources and composition of materials used as fertilizers, part 3 (pp. 395–507) with factors in the selection of fertilizing materials, and part 4 (pp. 509–710) with the practical use of fertilizers in the growing of individual crops.

Commercial fertilizers and agriculture of the Alps, O. KERLER (*Deut. Landw. Presse, 39 (1912), Nos. 33, pp. 391, 392, figs. 4; 34, pp. 402, 403, figs. 7*).—This is an account of the agricultural practices of the Alps and of experiments with barnyard manure and commercial fertilizers, showing that the practice of supplementing barnyard manure with a phosphatic fertilizer greatly increased the yield of crops, and in turn enabled the farmer to keep more stock and thus produce larger amounts of manure. Complete mineral fertilizers are recommended only where sufficient manure to fertilize the entire farm is not produced.

Calcium cyanamid as compared with nitrogenous fertilizers, L. R. DA SILVA (*Rev. Agron. [Portugal], 9 (1911), No. 1–6, pp. 94–107*).—Comparative tests of calcium cyanamid, sodium nitrate, and ammonium sulphate with various crops are reported.

The constitution of basic slag, HARTLEB (*Ztschr. Öffentl. Chem., 17 (1911), No. 20, pp. 381–384; abs. in Chem. Abs., 6 (1912), No. 5, p. 663*).—The author maintains substantially that Blome's experiments with fusions of tricalcium phosphate, lime, and silica (E. S. R., 25, p. 121) throw no light on the constitution of Thomas slag or on the cause of the increase in citrate-solubility of the phosphoric acid of the slag when it is fused with sand.

The influence of lime on cultivated soil (*Arch. Suikerindus. Nederland. Indië, 20 (1912), No. 13, pp. 379–383*).—This is a brief review of the investigations on this subject by Thaer (E. S. R., 25, p. 823).

The trade in cotton-seed meal, E. H. JENKINS (*Connecticut State Sta. Bul. 170, pp. 4*).—The plan worked out by the station, by which the dealer and consumer of cotton-seed meal may be assured of its quality, is described.

Experiments with gas purification residue as a weed killer, insecticide, and nitrogenous fertilizer, H. VON FEILITZEN (*Fühling's Landw. Ztg., 61 (1912), No. 8, pp. 285–294*).—The results were not very favorable to the use of the material for the purposes named.

Tannery refuse as a fertilizer, H. W. HEALY (*Rural New Yorker, 71 (1912), Nos. 4151, p. 622; 4152, p. 643*).—The method of preparation, nature, and fertilizing value of tannery refuse, ashes, and liquid are discussed. The first two are rich in lime, the latter is acid. The refuse contains from 0.75 to 2 per cent of nitrogen. The ashes contain in addition to from 30 to 50 per cent lime, from 0.75 to 1.5 per cent potash and 0.5 per cent phosphoric acid. Tannery liquids are of no fertilizing value until neutralized with lime and in some cases allowed to putrefy. Successful practical experiments in the use of refuse and ashes are referred to.

Refuse disposal, Toronto, Ont. (*Engin. News, 67 (1912), No. 8, pp. 325–328; Engin. and Contract., 37 (1912), Nos. 11, pp. 293–296; 13, pp. 351, 352; 15, pp. 417–419*).—This is a condensation of an extended report by R. Hering and J. H. Gregory, and deals with 2 methods of disposal, "(1) the incineration of garbage mixed with other and more combustible refuse, with no utilization of the heat of combustion, and (2) the treatment of garbage alone by the reduction process for the recovery of grease and of tankage for fertilizer base, and with the separate incineration of combustible refuse. The low price at which hydroelectric power is available in Toronto turned the scale in favor of the second alternative. If the salable portions of the combustible refuse were sorted out and sold and only the remainder burned, the estimates indicate a small profit from the combined operations of the reduction works and incinerating plants; otherwise there would be a slight yearly expense."

Analyses of fertilizers, fall season, 1911, B. W. KILGORE ET AL. (*Bul. N. C. Dept. Agr., 33 (1912), No. 3, pp. 96*).—This bulletin contains analyses of fertilizers collected by the fertilizer inspectors of the North Carolina state department of agriculture during the fall of 1911, as well as a list of brands of fertilizers registered for sale during the season 1911–12.

Tabulated analyses of commercial fertilizers, J. TOMLINSON (*Tenn. Dept. Agr. Fert. Bul. 1911, pp. 50*).—Analyses and valuations of fertilizers offered for sale in Tennessee during 1911 are reported. The text of the state fertilizer law and a schedule of current prices of fertilizing materials are also given. It is stated that 68,971 tons of fertilizers were sold in Tennessee during 1911 as compared with 58,612 tons in 1910.

Analyses of licensed commercial fertilizers, 1912, F. W. WOLL (*Wisconsin Sta. Circ. Inform. 33, pp. 12*).—This circular gives a list and guaranties of fertilizers licensed for sale in Wisconsin during the year, analyses of samples submitted by the manufacturers and collected by the station inspectors, and explanations of terms used in statements of analyses of fertilizers and in discussion of the subject of soil fertility.

AGRICULTURAL BOTANY.

Plant physiology, W. PALLADIN (*Pflanzenphysiologie. Berlin, 1911, pp. VI+310, figs. 180*).—This is a German edition, revised and brought up to date, from the sixth Russian edition of the author's work on plant physiology. It treats extensively of the chemistry of physiological processes.

Preliminary announcements of new findings in germination studies with Chloris ciliata, G. GASSNER. (*Ber. Deut. Bot. Gesell., 29 (1911), No. 10, pp.*

708-722).—This is a preliminary account of studies on the influences affecting germination, particularly those of light, and temperature changes in the seed bed. The author states that associated as modifying influences with the light factor are the 3 subfactors of oxygen access (affected by presence or absence of chaff), germinating temperature, and resting period (after maturity).

Seeds were subjected to maximum and minimum constant temperatures and comparisons made with lots in which high and low temperatures were employed for various definite periods. It was found that, while the absence of chaff raised the rate of germination in all cases, a constant high temperature (33 to 34° C.) gave almost a maximum rate of germination and in general the higher rates (94 to 95 per cent) were obtained by the longer periods of exposure (over half the day) to the high temperature. The lowest rate (29 per cent) resulted from exposure of the chaff-covered seeds to the minimum constant temperature (19 to 20°).

Temperature and seed germination, E. LEHMANN (*Ber. Deut. Bot. Gesell., 29 (1911), No. 8, pp. 577–589*).—The author gives a preliminary report of a series of investigations not yet complete on the effects of temperatures and temperature changes on the germination of seeds sensitive to light. The work stands in close relation to that of W. Kinzel (E. S. R., 22, p. 720; 26, p. 821). In part the same material was chosen and studied, with the results which were partly different or opposite given in considerable detail.

The effect of heat on seeds in a state of anesthesia, J. APSIT and E. GAIN (*Compt. Rend. Soc. Biol. [Paris], 70 (1911), No. 24, pp. 55–58*).—In previous publications (E. S. R., 22, pp. 27, 436) the authors showed the action of anesthetics and heat on the diastases of seed. In the present paper a brief account is given of experiments showing the effect of heat and anesthetics on germination.

Different lots of wheat were subjected to ether and ether vapors and then placed in water heated to 58° C. for 5 minutes, and the effect on germination determined. All lots of seed had been previously placed in cold water to bring their moisture content to about 21 per cent. The results show that, other conditions being equal, wheat subjected to anesthetics is much more affected by high temperature than seed not treated with ether. A few minutes' exposure to ether followed by the application of heat was sufficient to destroy the vitality of all the seed. Similar results were obtained with other anesthetics, as chloroform and a solution of cocaine.

If the interval between exposure to ether and placing the seed in hot water was progressively increased, the effect of the anesthetic appeared gradually to diminish and the percentage of germination to increase correspondingly.

The so-called respiration of powdered seeds, L. IWANOFF (*Ber. Deut. Bot. Gesell., 29 (1911), No. 8, pp. 563–570*).—The author reports a continuation of his investigations on carbon dioxid evolution and alcoholic fermentation in seeds (E. S. R., 26, pp. 731, 822), claiming that these support his former conclusions, namely, that the carbon dioxid evolved is largely, if not entirely, of anaerobic origin.

Effect of warm baths on respiration and germination of resting plants, P. P. IRAKLÏONOV (*Trudy Imp. S. Peterb. Obshch. Estestvo. (Trav. Soc. Imp. Nat. St. Petersb.), 42 (1911), III, No. 2–8, pp. 239–270, figs. 4*).—The author sums up the conclusions reached in his investigations substantially as follows:

Warm baths heighten the energy of respiration only during the first few days, after which the respiration curve remains at its normal resting level until it rises on germination. The effects of the warm bath are to be attributed not only to the influence of temperature but also to that of the water. This effect is not a simple and transient stimulation but a complex, deep-lying

process the end result of which is the awakening of the plant. The experiments seem to indicate the activity of enzyms in this connection. It appears that along with oxidation (as evidenced by the carbon dioxid product) several other processes go on, some of them accompanied by evolution of heat.

Shortening the resting period of shoots by wounding and injection of water, F. WEBER (*Sitzber. K. Akad. Wiss. [Vienna], Math. Naturw. Kl., 120 (1911), I, No. 3, pp. 179–194, pl. 1*).—A report is made in regard to experiments conducted with buds on twigs of several sorts in hothouses, either by merely wounding, or in addition thereto, injecting water at the base of the bud.

It was found that in almost every case injured buds preceded in opening and rapidly outgrew the buds on the same sprouts not so treated. It appeared that the wounding was the most significant factor, but that the injection of water also played a certain rôle in the abnormally early and rapid development.

The influence of enzyms on the respiration of plants, S. D. L'VOV (*Izv. Imp. Akad. Nauk. (Bul. Acad. Imp. Sci. St. Pétersb.), 6. ser., 1911, No. 9, pp. 655–678; abs. in Jour. Chem. Soc. [London], 100 (1911), No. 585, II, p. 641*).—The author reports that taka-diastase exerts a stimulating action on the respiration of living or dead plants of *Vicia faba* and wheat. This action is especially marked with living plants where anaerobiosis initially takes the form of alcoholic fermentation. Merck's diastase produced effects opposite to, and of less magnitude than, those of taka-diastase.

Emulsin was found to produce the same effects in the boiled and the unboiled condition and to exert a marked retarding action on alcoholic fermentation brought about by hefanol. It exhibited a stimulating influence on the respiration in dead seeds, hence under abnormal conditions, but on the normal respiration of living higher plants it had no effect.

Further studies on the light requirement of plants in relation to leaf form and position, J. WIESNER (*Sitzber. K. Akad. Wiss. [Vienna], Matt. Naturw. Kl., 120 (1911), I, No. 3, pp. 119–178*).—This is a report on a continuation of the author's former studies on light relations of leaves (E. S. R., 23, p. 724), and is a somewhat extended discussion of leaf position as related to light requirement.

Plants with leaves which show no relation of their position to the incidence of light are here called aphotometric. Other plants assume positions which are favorable to light incidence or to protection for oversupply. These positions may become fixed, as in the case of the compass plants, etc.

The results of studies made on several plants are given in some detail.

The relation of light and temperature to leaf fall, O. VARGA (*Österr. Bot. Ztschr., 61 (1911), No. 2–3, pp. 74–88; abs. in Magyar Bot. Lapok [Budapest], 10 (1911), No. 11–12, pp. 448, 449*).—The author reports a direct relation between a lack of light and a low temperature and leaf fall of plants through the influence which these factors have in diminishing transpiration and assimilation. A reduction of light or temperature appears to act through the assimilation and transpiration of the plant, stimulating the formation of the abscisslayer at the bases of the petioles and resulting in the fall of the leaves.

Studies on cessation of flowering, H. WACKER (*Jahrb. Wiss. Bot. [Pringsheim], 49 (1911), No. 4, pp. 522–578, pls. 3, figs. 5; abs. in Ztschr. Bot., 4 (1912), No. 2, pp. 133, 134*).—This is a comparative study of the various phenomena accompanying this change in case of many flowers.

Opening and closure of stomata as shown by the method of infiltration, H. MOLISCH (*Ztschr. Bot., 4 (1912), No. 2, pp. 106–122, figs. 2*).—A new method of demonstrating the closure or degree of opening of stomata is described, which

consists essentially in placing upon the under surface of the leaf a small portion of a certain liquid and observing the rate of its infiltration as evidenced by its forming in that part of the leaf a spot which, by transmitted light, is translucent.

For this purpose it is stated that water will not answer, but alcohol is found suitable, while benzol, xylol, and oil of turpentine are very much more sensitive indicators in most cases. With a decrease of the openings, filtration diminishes. At a certain point alcohol, it is claimed, ceases to pass, while the other liquids continue to enter, thus distinguishing between very small degrees of opening and absolute closure. Detailed and tabulated findings are given of a great number of studies carried on with many different plants. Stomata in fresh leaves were nearly always found to be open on sunny days, but nearly or entirely closed at night. In case of wilted and dried leaves the stomata were usually almost or quite closed, in many cases even to benzol.

Several advantages are claimed for this method over others now in use, some of which are here discussed, as are also the results obtained by their employment.

A new method of estimating the aperture of stomata, F. DARWIN and D. F. M. PERTZ (*Proc. Roy. Soc. [London], Ser. B, 84 (1911), No. B 569, pp. 136–154, figs. 10; abs. in Ztschr. Bot., 4 (1912), No. 2, pp. 142, 143*).—The estimate of stomatal aperture obtained by this method (called the porometer method) is based upon the amount of air drawn through a funnel tube, glued to the stomatal surface of the leaf, as shown by a column of water in the stem of an attached and partly exhausted T-tube. The air is drawn through the stomata outside the glass funnel, through the leaf tissue, and again through the stomata inside, its amount and variations being measured by means of the fall of the water column in the stem of the T-tube. The merits claimed for the method are that (1) the results obtained are independent of transpiration and (2) the living, uninjured stomata can be studied continuously for hours or days together.

Among the results given of studies already made by this method, it is claimed to have been shown that in case of leaves severed from the plant the first effect of withering is the opening of the stomata, followed, however, by their closure. Publication of other results is also promised.

Transpiration in wet leaves, V. S. ILIN (*Trudy Imp. S. Peterb. Obshch. Estestvo. (Trav. Soc. Imp. Nat. St. Petersb.), 42 (1911), III, No. 2–8, pp. 359–414, figs. 23*).—This is an account of a series of experiments on the transpiration and related phenomena in leaves soaked in water or in solutions of salts.

It was found that when the stomata are open naturally transpiration in wet plants is always heightened and that such plants desiccate rapidly, the curve of transpiration approximating that shown by plants in the damp atmosphere of dewy mornings. If compelled to open their stomata, however, by immersion in potassium nitrate solution, the plants show no increase in transpiration or in rapidity of desiccation. No such increase of transpiration follows the wetting of plants the stomata of which are closed, except a slight increase observable after long immersion in case of plants having thin cuticle. Immersion tends to cause closure of the stomata, but this tendency is opposed by light. Some leaves lost up to 43 per cent of their weight before their stomata were found to be closed. Transpiration curves showed interrupted variations which bear a certain relation to the curves of water absorption by the leaves.

Transpiration and the ascent of sap, H. H. DIXON (*Ann. Rpt. Smithsn. Inst. 1910, pp. 407–425, figs. 4*).—A summary is given of evidence that is held to support the author's cohesion theory of the ascent of sap in plants (E. S. R., 18, p. 825; 21, p. 725).

Measuring the transpiration of emersed water plants, C. H. Otis (*Rpt. Mich Acad. Sci., 13 (1911), pp. 250–253, pls. 2*).—A description is given of a form of tank devised by the author for measuring the evaporation of emersed water plants.

It was found that unsubmerged water plants transpire large quantities of water, and that this takes place principally during the day time. In the case of the one exception, the water lily, the presence of the plants in the tanks materially retarded evaporation from the free water surface.

The relative wilting coefficients for different plants, L. J. Briggs and H. L. Shantz (*Bot. Gaz., 53 (1912), No. 3, pp. 229–235*).—Observations have been made of a considerable number of plants growing in different types of soil to determine their wilting coefficient (E. S. R., 26, p. 822). These included cereals, grasses, and wild plants from semiarid and arid regions, and the results obtained led the authors to conclude that the variation exhibited in the wilting coefficient of different plants is much less than has hitherto been supposed, and that it is insignificant compared with the range in moisture retentiveness exhibited by different soils.

Only slight differences were found to exist among the various crops in their ability to reduce soil moisture content before wilting occurs. Sorghum, millet, wheat, oats, barley, and the grasses are practically the same. Rye and rice appear a little lower than the mean, and corn and the legumes slightly higher.

Conditions which affect the branching of roots, Lulu M. Newlon (*Rpt. Mich. Acad. Sci., 13 (1911), p. 200*).—Observations were made on a number of species of plants to determine the factors which influence the branching of roots. It is a well-known fact that when roots are injured at their tips they produce lateral rootlets, but the experiments, in which about 1 dozen species of plants were used, indicate that contact does not act as a stimulus for the production of lateral roots. In most of the plants lateral roots were freely produced in the soil. In some aquatic and semiaquatic plants light inhibited the growth of the roots, while in the terrestrial plants, when the roots were under water, the lateral branching took place with equal freedom in light and in darkness.

Agricultural microbiology, E. Kayser (*Microbiologie Agricole. Paris, 1910, 2. ed., rev. and enl., pp. 481, figs. 95*).—This is a revised and enlarged edition of a work previously noted (E. S. R., 17, p. 849).

Soil fungi, H. N. Goddard (*Rpt. Mich. Acad. Sci., 13 (1911), pp. 208–214*).—A preliminary report is given of fungi found in soils, which indicates an abundant fungus flora which is conspicuous, rather uniformly distributed, and constant in different soils. Tillage and manuring, so far as observations have gone, seem to produce little change in the species and number of individuals present. Many of the fungi show variability in their structural characters when cultivated on media of constant composition. One form, which showed the structural characters of Fusarium and Cephalosporium, is thought to be the probable cause of a wilt disease which attacks several species of garden plants, including asters, sweet peas, zinnias, and *Salvia splendens*.

The occurrence of Zygorhynchus moelleri in Michigan, H. Grossman (*Rpt. Mich. Acad. Sci., 13 (1911), pp. 204–207, figs. 2*).—The author reports the discovery in soil samples of *Z. moelleri*, a rather common soil fungus of Europe.

Formation of volatile acids after fermentation, A. Osterwalder (*Centbl. Bakt. [etc.], 2. Abt., 32 (1912), No. 20–25, pp. 481–498*).—The author studied the after growth of several yeasts in fruit and grape juices with reference to the simultaneous production of volatile acids, with findings substantially as follows:

After the cessation of fermentation by pure yeast a new and often luxuriant growth appears, showing as flocculent or glistening layers of new yeast on or near the bottom. Under the same circumstances and at the same time at from 20 to 22° C. in 4 or 5 months a volatile acid, said to be acetic, forms to the amount of about 0.18 per cent. This apparently depends not upon the presence of unfermented sugar or upon the simple oxidation of alcohol but upon the presence of certain kinds of yeast. The author thinks it possible, however, that these yeasts are able by means of oxidases to oxidize alcohol to this acid.

A new fermenting fungus, A. OSTERWALDER (*Centbl. Bakt. [etc.], 2. Abt., 33 (1912), No. 11–14, pp. 257–272, pl. 1, figs. 2*).—Continuing the above studies, the author reports that he has discovered, isolated, and cultivated an actively fermenting fungus said to be new and by him named *Monilia vini*, in regard to which the following particulars may be noted:

M. vini, isolated from an acid apple wine, proves to be the most active in producing fermentation of all the Monilia forms, completely fermenting fruit and grape wine, this change occurring most rapidly with free access of air. The new species is able to develop rapidly in as strong a solution as 1.2 per cent of malic acid, also to ferment sugar in 0.4 per cent of alcohol, giving as a result of such fermentation both volatile and nonvolatile acids along with alcohol. It appears able to ferment any sugar remaining after the cessation of ordinary vinous fermentation, to the advantage of the wine, showing no injurious effects. It seems to ferment most rapidly dextrose and levulose; less rapidly saccharose, lactose, and galactose; and least rapidly maltose. In fermentation of the last of these and the first two the fungus develops much volatile acid.

Biological characteristics are described at some length.

The mycorrhiza of Solanum, N. BERNARD (*Ann. Sci. Nat. Bot., 9. ser., 14 (1911), No. 4–6, pp. 235–258, figs. 12; abs. in Bot. Gaz., 53 (1912), No. 3, p. 271*).—In continuation of investigations on the association of fungi with the formation of tubers in certain plants (E. S. R., 14, p. 635), the author had begun a study of tuber formation in Solanum, but the work was stopped by his death. In the paper presented some account of his investigations is given. He had found that *S. dulcamara* and *S. maglia* when grown under normal conditions had their roots infested with fungi, but that when grown in gardens *S. maglia* did not show any mycorrhiza. The results obtained are believed to be suggestive of tuber formation in the potato in a wild state.

Gastrodia elata and its symbiotic association with Armillaria mellea, S. KUSANO (*Jour. Col. Agr. Imp. Univ. Tokyo, 4 (1911), No. 1, pp. 1–66, pls. 5, fig. 1*).—According to the author, *G. elata* is a nonchlorophyllous orchid which is unable to exist as an autophyte. The vegetative organ of the plant is represented simply by a tuberous rhizome. It forms mycorrhiza with the mycelium of *A. mellea*, or, as it is often called, *Rhizomorpha subterranea*. Tubercles cultivated in pots with sand, loam, or humus soil produced numerous offshoots, but none of them ever reached the flowering stage. The saprophytic development of the fungus reduces the vegetative organs of the orchid, and flowering stalks are produced. It was found that only when the mother tuber contains mycorrhiza does it develop a full-grown offset, which remains dormant during the winter and develops the inflorescence axis the spring of the next year.

The fungicidal action of bulbs of orchids, N. BERNARD (*Ann. Sci. Nat. Bot., 9. ser., 14 (1911), No. 4–6, pp. 221–234, figs. 3; abs. in Bot. Gaz., 53 (1912), No. 3, pp. 267, 268*).—The fact that certain orchid bulbs have been found free from fungi while the roots contained mycorrhiza led the author to a study of the phenomenon of the fungus not passing from the roots to the succulent bulbs.

Fragments of bulbs were placed in tubes containing cultures of fungi isolated from various orchids. The growth was inhibited wherever the fungus came in contact with the fluids given off from the bulbous material.

The conclusion is reached that the bulbs from some orchids contain a substance of a fungicidal nature that may be considered comparable to a diastase. It is readily diffusible and is destroyed at a temperature of 55° C. The action is considered specific and is held to confirm the hypothesis of the author regarding the symbiosis with mycorrhizal fungi, while protecting the main body of the plant against invasion (E. S. R., 22, p. 722).

Effects of Roentgen rays on micro-organisms and ferments, II. GÜNTHER (*Sitzber. Naturhist. Ver. Preuss. Rheinlande u. Westfalens, 1910, No. 1, Sect. B, pp. 11, 12; abs. in Bot. Centbl., 116 (1911), No. 24, p. 614*).—A brief note reviewing the literature on this subject, most of which is declared to show negative results.

Nitrogen-fixing bacteria in leaves of Rubiaceæ, F. C. VON FABER (*Adv. print from Bul. Dépt. Agr. Indes Néerland., 1911, No. 46, pp. 3*).—The author presents a preliminary report of investigations in progress, from which he is able to give results and conclusions in substance as follows:

The plants of this group bearing these bacteria may be outwardly known by peculiar knotty thickenings of the leaves filled with bacteria. Garden species so affected are *Pavetta indica, P. lanceolata, P. angustifolia, P. zimmermanniana*, and *Psychotria bacteriophila*. Bacteria are found in the growing points and from there supposedly extend with the growth of the plant, being found in the buds, flowers, fruit, and seeds. In the young bud leaves the stomata open abnormally early and the massed bacteria press into the leaf interior, loosening the cellular structure and causing characteristic cytological changes which result in the production of a characteristic bacterial tissue. In this a considerable number of starch grains appear, supposedly to serve nutritive purposes for the bacteria.

Already bacteria have been isolated by culture from *P. indica* and *Psychotria bacteriophila*, one species only from each. The bacteria of Rubiaceæ seem to show great similarity among themselves and may be adapted forms of one original species. The author thinks that these bacteria play the important rôle in the life of the plants in which they live of fixing atmospheric nitrogen, and claims that this conclusion is supported by the experimental evidence thus far obtained. This work of fixation is thought to be limited to the bacterial leaf galls where the bacteria are present in largest numbers and where the nitrogen is present mainly in the form of protein.

Nitrogen fixation by fungi in relation to nitrogen nourishment, G. STAHEL (*Jahrb. Wiss. Bot. [Pringsheim], 49 (1911), No. 4, pp. 579–615; abs. in Bot. Centbl., 119 (1912), No. 1, pp. 9, 10*).—These experiments were undertaken for the purpose of finding, if possible, new cases of nitrogen fixation by fungi and of studying the relation of nitrogen assimilation to nitrogen content in their food supply.

The organisms belonged for the most part to the so-called imperfect fungi, 54 species being investigated. In case of a nutrient solution containing 0.0001 per cent of nitrogen, it was found possible to divide the fungi into groups, the first of which, containing 25 species, showed no growth but much oil and was entirely sterile; the second, comprising 22 species, showed better but slight growth and considerable oil, and was almost or quite sterile; a third group of 5 species showed relatively good growth, very good fruiting, and but little oil. Of the 9 species which showed nitrogen fixation 4, it is claimed, had not before been credited with that power. These are *Botrytis cinerea, Bispora molinioides, Epicoccum purpurascens*, and *Melanomma* sp. Three fungi were found to contain nitrogen as compared with the amount in the nutrient solution in the ratio of 1:1, while one showed a ratio of 1:4. These ratios, it is stated, tend to rise with an increase of nitrogen content in the substratum.

Nitrogen assimilation and a new hypothesis of the first stages of protein formation, O. Baudisch (*Centbl. Bakt. [etc.], 2. Abt., 32 (1912), No. 20–25 pp. 520–540*).—Continuing previous work (E. S. R., 25, p. 435) the author presents in detail his further studies regarding the steps and agencies in nitrogen assimilation and his hypothesis of a photo-chemical agency in connection therewith. He claims that these studies show results confirmatory of the hypothesis.

Protein synthesis in lower plants, K. Puriewitsch (*Biochem. Ztschr., 38 (1912), No. 1–2, pp. 1–13*).—This is an investigation of the relative availability of different nitrogen compounds for the synthesis of protein. Proceeding upon the assumptions (1) that such synthesis may be judged with a degree of accuracy from the amount of carbon dioxid produced, as a measure of the energy required in the oxidation of the nitrogen compounds, and (2) that the less available require the more energy, the author cultivated *Aspergillus niger* on a suitable substratum in numerous experiments, employing different compounds of nitrogen as nitrogen sources. The weight of carbon dioxid evolved in each experiment was compared with the dry weight of mycelium so employed and the ratios so found were then compared.

The results obtained are said to show that the employment of energy in protein synthesis is least when the amino acids are used as sources of nitrogen. In case of ammonia salts, and particularly of the nitrate, it is considerably greater. From this fact (supported by other observations and inferences) the author concludes that the amino acids are the best sources of nitrogen for protein synthesis.

A physiological study of nitrate-reducing bacteria, E. B. Fred (*Centbl. Bakt. [etc.], 2. Abt., 32 (1912), No. 13–19, pp. 421–449 pls. 6, figs. 9*).—Details are given of an extended investigation of 4 bacteria, *Bacillus fluorescens liquefaciens*, *B. pyocyaneus*, *B. denitrificans*, and *Bacterium hartlebi*, in regard to their reducing activity as influenced by such factors as energy supply, presence of nitrites and indicators, and occurrence of certain reactions.

Potash requirement by the nitrogen bacteria, I. Vogel (*Centbl. Bakt. [etc.], 2. Abt., 32 (1912), No. 13–19, pp. 411–421*).—This is a resumption of work previously undertaken by the author in connection with M. Gerlach (E. S. R., 15, p. 449). It is claimed that the results of the experiments now reported confirm the conclusions resulting from the earlier series, namely, that a certain development of the bacteria and nitrogen fixation may occur in the absence of potash compounds from the nutrient solution, but that the intensity, both of growth and of nitrogen assimilation, is greatly increased by its presence in suitable quantity.

Ammonia and nitrates as a nitrogen source for mold fungi, G. E. Ritter (*Ber. Deut. Bot. Gesell., 29 (1911), No. 8, pp. 570–577*).—In continuation of a previous study (E. S. R., 22, p. 724), investigations were carried out with *Cladosporium herbarum*, *Mucor racemosus*, and *M. spinosus*, as a result of which the author claims that the nitrate-assimilating fungi are quite commonly able under suitable conditions (in neutral or alkaline culture solutions) to reduce nitrates to nitrites as a first step in such assimilation. This view is held to be supported by the observation that the nitrites can also be utilized as a source of nitrogen.

Anaerobic decomposition of protein and intramolecular respiration in plants, E. Godlewski (*Bul. Internat. Acad. Sci. Cracovie, Cl. Sci. Math. et Nat., Ser. B, 1911, Nos. 8, pp. 623–704, fig. 1; 9, pp. 705–717*).—Attempts were made to determine by experiments with seeds of white and of blue lupines in air-free containers the relation of dependence, if any, which exists between these two processes. The conclusions drawn by the investigator from the final analyses are briefly as follows:

Anaerobic decomposition of protein in seeds of lupines in water or in sugar solutions is entirely independent of the intensity of their intramolecular respiration. Both these processes are affected by the dissolved sugar, however, which decreases the former, but increases the latter process. The former, moreover, goes on long after the latter has ceased, even after the seeds have been killed by suffocation.

It follows, according to the author, that anaerobic decomposition of protein in lupines is an enzymatic process. In the early stages of the experiments albumose and peptones were broken down; later the more complex proteids. In the living seeds the protein decomposition appears to be proportional to the time of its duration; after their death, to the square root of the time. Intramolecular respiration in the glucose solution appears to go on in the lupine seeds alike whether resting or sprouted, which fact is taken to indicate that no new synthesis of zymase occurs during germination; but in water alone this process is at first much more rapid in the sprouted seeds, which phenomenon is attributed to the hydrolysis of the reserve material in the seeds and not to increase of zymase. Pepsin is also supposed to form during germination. Citric acid added to the solutions was not utilized in intramolecular respiration, but appears to decrease it and to shorten its period.

The nutrition of some epiphytic Bromeliaceæ, C. Picado (*Compt. Rend. Acad. Sci.* [*Paris*], *154* (*1912*), *No. 9, pp. 607–609*).—As the result of a study of a number of species of epiphytic bromelias, the author claims that they absorb not only their mineral, but also their proteid and other substances from the vegetable and animal detritus held by their leaves. It is possible that these are the only plants the nutrition of which depends entirely upon the detritus collected in the depressions at the base of the leaves.

On the origin of carbon assimilated by plants, L. Cailletet (*Compt. Rend. Acad. Sci.* [*Paris*], *152* (*1911*), *No. 19, pp. 1215–1217; abs. in Bot. Centbl., 119* (*1912*), *No. 2, p. 35*).—Studies on Adiantum, Aspidistra, and other plants habitually growing in rather dense shade are reported, in which it is shown that their photosynthesis was not sufficient to account for the carbon present in their structures. Experiments showed that these plants obtained a part of their carbon from the soil, indicating that they have two sources of carbon, the carbon dioxid of the air and the organic compounds of the soil.

Chlorophyll in plants and colloidal chlorophyll, A. Herlitzka (*Biochem. Ztschr., 38* (*1912*), *No. 3–4, pp. 321–330*).—The author has attributed the displacement of the absorption bands in spectra of living leaves toward the red end (as compared with those of solutions of chlorophyll in alcohol, etc.) to the supposedly colloidal condition of chlorophyll in a gelatinous solvent, and this is a study of colloidal solutions of chlorophyll prepared from spinach, carried out with the aim of throwing light on the condition of chlorophyll as it exists in living plants.

He concludes that in expressed leaf sap the chlorophyll is held in a different state from that in case of ordinary solutions, and asserts that it is the same as in colloidal chlorophyll solutions. This colloidal solution shows the presence of a dispersoid, while it is still a question whether this may be said of a solution of chlorophyll in alcohol or acetone. Such colloidal chlorophyll is stated to be an electronegative colloid, unstable and easily forming a flocculent precipitate. The difference between the spectrum of chlorophyll dissolved in alcohol and that of the chlorophyll in leaves, expressed sap, etc., is declared to be attributable to the fact that in the latter case the chlorophyll is in the colloidal state not as a genuine colloid, but as a dispersoid. The identity of the chlorophyll in leaves with that in colloidal solutions is admittedly not yet fully established.

Studies on anthocyanin, III, V. GRAFE (*Sitzber. K. Akad. Wiss. [Vienna]. Math. Naturw. Kl., 120 (1911), I, No. 6, pp. 765–810, figs. 2*).—In studies on the coloring matter of Pelargonium, the author was able to separate the material studied into two main parts, one, deep yellowish-red and crystallizable, the other, brown-red, drying to an amorphous mass. He considers the latter probably a decomposition product of the former. Further particulars of a microscopic and chemical study and of their relations to known compounds are given.

Investigations on the origin of alkaloids in plants, G. CIAMICIAN and C. RAVENNA (*Ann. Chim. et Phys., 8. ser., 25 (1912), Mar., pp. 404–421*).—Experiments were made by inoculating tobacco and Datura, plants which contain known alkaloids, with solutions of various nitrogenous and nonnitrogenous compounds. The experiments are not considered extensive enough to demonstrate the origin of the alkaloids, but they are thought to indicate that the amido acids play an important part in their synthesis. In general, pyridin and ammonia exerted little influence in increasing the total alkaloids, while the injection of asparagin resulted in a great increase. Glucose increased the nicotin content of tobacco plants, while phthalic acid reduced the alkaloid content.

In connection with these investigations it was found that the alkaloids increased in the check plants that were simply wounded without the injection of any substance.

The tannin-colloid complexes in the fruit of the persimmon, F. E. LLOYD (*Biochem. Bul., 1 (1911), No. 1, pp. 7–41, pls. 3*).—From further studies on tannin in fruits (E. S. R., 25, p. 28), it is concluded that the explanations heretofore given concerning the fate of tannin during the process of ripening in the date and the persimmon are inadequate. The author claims that tannin as such is not insoluble, but that it has in large part combined with an associated colloid to form an insoluble colloidal complex. Evidence for this has been found in the behavior of the tannin-mass in relation to free tannin and chemical reagents. The tannin-mass is claimed to have an internal structure, consisting of a system or complex of canals, spaces, etc., which have a definite existence. Their behavior during the maturing of the tannin cell and their forms are described in considerable detail. The material called the tannin-mass is a tannin-colloid complex, the second portion of which appears to be a cellulose mucilage. During the course of ripening of the fruit the amount of free or soluble tannin is reduced, and as long as any is present it may escape from the tannin-mass. The view is advanced that during ripening the supposed cellulose mucilage increases in quantity and that eventually sufficient forms to engage most of the tannin.

Influence of iron on the growth of certain molds, B. SAUTON (*Ann. Inst. Pasteur, 25 (1911), No. 12, pp. 922–928; abs. in Rev. Sci. [Paris], 50 (1912), I, No. 11, pp. 336, 337*).—A study was made of a number of species of Aspergillus, Penicillium, Mucor, Rhizopus, and Racodium grown in Raulin fluid in the absence of any iron salt. Aspergillus and Penicillium did not increase in weight to any appreciable extent, while the other fungi seemed to be able to grow in the absence of iron.

It is observed that the simultaneous presence of iron and oxygen seems essential for the formation of spores; they always appeared in the parts of the culture which had the greatest access to the air. Spore formation seems to be accompanied with the fixation of oxygen, and this is probably brought about through the action of the iron.

The extraordinary sensitiveness of Aspergillus niger to manganese, G. BERTRAND (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 9, pp. 616–618*).—

The author shows that *A. niger* is sensitive to 1 part in 10,000,000,000 of manganese. On account of this great sensitiveness the author calls attention to the necessity for the use of chemically-pure substances in culture media. The ordinary iron sulphate of commerce is said to contain from 0.2 to 0.5 part in 1,000 of manganese.

The poisonous action of oxalic acid salts and the physiological action of calcium, O. Loew (*Biochem. Ztschr., 38 (1912), No. 3–4, pp. 226–243*).—As a result of this extension of his former investigations, now made on seeds, shoots, and roots of several cultivated plants, on the leaves of aquatic plants, and on various algæ and fungi, as well as lower water animals, the author announces that potassium oxalate exerts a poisonous influence upon the most diverse plant forms (exclusive of the lowest algæ and fungi which also require no calcium). A relation is argued between the physiological significance of calcium compounds and the injurious effects of oxalates. Observations show that the injurious reaction of the latter manifests itself in the cell nucleus and the chloroplasts, from which he infers the presence of a compound of calcium in such vegetable cells (as in lower animal cells which exhibit physiological analogies in this respect).

Effects of basic compounds on seedlings and on the lower organisms, T. Bokorny (*Centbl. Bakt. [etc.], 2. Abt., 32 (1912), No. 20–25, pp. 537–605*).—The author, in pursuance of previous studies (E. S. R., 25, p. 433), investigated the influence of various dilute basic compounds on the development of seedlings and of micro-organisms. It was found that, while solutions of 0.01 to 0.25 per cent prevented or retarded development in case of nearly all compounds studied, ammonium chlorid exerted the most deleterious effect, and that such effect was noticeable in the very lowest concentrations of this salt tested.

Movement of minerals in autumn leaves, E. Ramann (*Landw. Vers. Stat., 76 (1912), No. 3–6, pp. 157–164*).—The author's analyses, at suitable intervals, of leaves of beech, oak, hazel, and birch, led him to conclude (1) that, in the normal dying of leaves in autumn, there is a considerable movement of proteins from the leaves to the stem; (2) that the movement of potassium and the movement in considerable quantity of phosphoric acid in the same direction seems to be influenced by the nourishment of the stem; (3) that lime and silica about double in quantity in the leaves before death; (4) that these transfers take place during the short period of yellowing and dying; and (5) that these exchanges are more significant in the life of the plant than has commonly been held by investigators.

Mineral movements on freezing of leaves, E. Ramann (*Landw. Vers. Stat., 76 (1912), No. 3–6, pp. 165–167*).—Continuing the above studies, the author reports upon the effects of freezing the leaves of oak, pine, and fir on the translocation of mineral substances. The partial freezing of the foliage, October 18, 1909, made it possible to compare not only injured and uninjured leaves of the same tree but also frozen and unfrozen parts of the same leaves.

As a result of his comparative analyses of the ashes of leaves taken while living and of frosted leaves, he reports (1) that both the protein and the sulphur contents of the leaves remained unchanged on freezing; (2) that potassium and phosphoric acid were considerably decreased; (3) that calcium was added in large quantity as in regular autumn dying of leaves; and (4) that these changes occurred in the very short interval between thawing and drying out, which fact is pointed to as an illustration of the possibilities of rapid transportation in dying or dead leaves.

Smoke, fumes, and cultivated soil (*Rev. Sci. [Paris], 50 (1912), I, No. 10, pp. 311, 312*).—Brief reference is made to investigations by Wieler on the

injurious effect of smoke and factory fumes on soil and vegetation in the region of Aix-la-Chapelle.

It was found that the factory fumes contained sulphuric, sulphurous, and hydrochloric acids, which dissolved the lime of the soil and thus rendered the soil increasingly acid and interfered with the bacterial activity of the soil, particularly nitrification. Liming corrected this condition and prevented destruction of plant growth in case of forest trees. The chestnut appeared to be one of the most resistant trees to acid fumes. In addition to the harmful effect on the soil, the fumes occasionally caused direct injury by corrosion and by deposit of soot on the leaves.

Premature fall of flower petals, H. FITTING (*Jahrb. Wiss. Bot.* [*Pringsheim*], *49* (*1911*), *No. 2, pp. 187–263, figs. 3; abs. in Ztschr. Bot., 4* (*1912*), *No. 2, pp. 131–133*).—This is a detailed account of the author's study of the casting of fresh and even of very young petals of *Geranium pyrenaicum* and several other plants found to be highly sensitive to certain influences unfavorable in this respect. Among these influences are gases and vapors in the atmosphere, particularly illuminating gas, carbon dioxid, tobacco smoke, chloroform, ether, and hydrochloric acid; high temperature, agitation, and dryness; and wounding of the petals.

Some very sensitive plants showed reaction to the unfavorable stimuli within a few seconds. The fall of the petals occurred after periods varying from a few minutes to several hours. Further studies are contemplated. A bibliography is appended.

Bud mutations of Solanum maglia, E. HECKEL (*Compt. Rend. Acad. Sci.* [*Paris*], *153* (*1911*), *No. 7, pp. 417–420*).—In continuation of a previous note (E. S. R., 20, p. 733), an account is given of a bud mutation of *S. maglia* produced by heavy manuring in conjunction with the use of artificial fertilizers.

In 1910 the author obtained 5.5 kg. of tubers of the mutating form, most of which were of a reddish violet color. These tubers were planted in April, 1911, and produced a considerable crop, many of the individual tubers weighing from 350 to 380 gm. and some of the hills yielding as much as 2 kg. The plants appeared completely free from fungus diseases.

Attention is called to some of the variations which have apparently become fixed in this form, and the author notes the occurrence of violet colored tubers both in this species and in *S. commersonii*. This is thought to indicate that the contention that the Giant Blue, a well-known variety of *S. tuberosum*, is the same as the mutant of Labergerie is not correct.

A study of hybrids between Nicotiana bigelovii and N. quadrivalvis, E. M. EAST (*Bot. Gaz., 53* (*1912*), *No. 3, pp. 243–248, figs. 4*).—Studies of these species of Nicotiana have been carried through several generations, and the author has discovered 2 elementary species of *N. bigelovii*. In one the capsules are 2-celled and selection of individuals has not increased the number, while in the other species there is a tendency to more than 2 cells in the capsule, which tendency is always transmitted.

The author believes that the species *N. quadrivalvis* and normal *N. bigelovii* are alike in all specific characters except the number of cells, and since they give fertile hybrids it is proposed that the first species should be considered a variety, its name being *N. bigelovii quadrivalvis*.

A retrogressive metamorphosis artificially produced, S. ALEXANDER (*Rpt. Mich. Acad. Sci., 13* (*1911*), *p. 198*).—The author states that occasionally matured flowering buds of the peach inserted in a stock by bud grafting will develop, in which case the peduncle increases to a length of 5 or 6 in., the sepals grow to the size and length of full-sized leaves, and the petals and stamens are

also greatly modified. If these flowers are permitted to develop further they will send out buds which will ultimately grow into a branch.

The influence of the seed upon the size of the fruit in Staphylea, I, J. A. HARRIS (*Bot. Gaz., 53 (1912), No. 3, pp. 204–218, figs. 4*).—The author has found that the length of the fruit and the number of ovules formed, as well as the seeds developing, are interdependent, and often very closely so. The correlation for length and number of seeds per locule is higher than that for length and number of ovules per locule. These two facts taken in conjunction indicate a physiological relationship between the length of the fruit and the number of seeds developing.

FIELD CROPS.

The relation of electricity to vegetation and agricultural products, A. BRUTTINI (*Azione dell' elettricità sulla vegetazione e sui prodotti delle industrie agrarie. Milan, 1912, pp. XVI+459; rev. in Agr. Mod., 18 (1912), No. 5, p. 73*).—This work is divided into 4 parts, the first of which deals with atmospheric electricity, and the second with ancient and modern observations of the rôle of electricity in plant physiology. The third part deals with the effect of electricity on the germination of seeds and the development of plants, proceeding in chronological order from 1746 to 1911, and states the results of some hitherto unpublished experiments. The fourth part presents the results of studies of the effects of X-rays on the causes of fermentation in must, wine, vinegar, alcohol, butter, milk, eggs, and other agricultural products.

Electroculture at Halle, J. KÜHN (*Ber. Physiol. Lab. u. Vers. Anst. Landw. Inst. Halle, 1911, No. 20, pp. 219–227*).—The author quotes some results obtained by Lodge and cites experiments conducted by Breslau at Kryschanowitz in 1903, in which electrical influence apparently increased the yield of strawberries 128 per cent, of sugar beets from 120 to about 140 per cent, and of barley and beans about 32 per cent.

In some of the author's experiments one-third of each plat of a fertilizer test with clover was influenced by electricity, one-third left uninfluenced, and the middle third used as a buffer. The middle third excelled either of the others, and the electrified third gave somewhat the lowest average hay yields.

In the remainder of his experiments the fertilizer plats were divided into only 2 parts. Unelectrified and nonirrigated rye averaged 6.6 per cent more straw and 11.2 per cent more grain than the electrified portions of the plats. There were apparently slight increases of potato yields on the electrified portions of plats except under irrigation, where the unelectrified crop produced a markedly heavier yield with a somewhat lower starch percentage. In case of mangels the electrified crop gave 9.96 per cent more roots and 8.66 per cent more leaves than the unelectrified crop, while electrified sugar beets gave considerably higher yields of roots which also stood somewhat higher in sugar percentage on both irrigated and nonirrigated plats. Under irrigation, barley, rye, winter wheat, and summer wheat gave about the same grain and straw yields whether electrified or not.

The influence of root development on the tillering power of cereals, A. E. PARR (*Agr. Jour. India, 7 (1912), No. 1, pp. 73–78*).—The author states briefly some results obtained by planting cereals in accordance with the Demtschinsky and Zehetmayr methods. The Demtschinsky method, as described, consists of transplanting young plants in such a way as to leave them from 1½ to 2 in. deeper in the ground. This leaves the lowest nodes beneath the surface and causes the development of adventitious roots. Yields of 8,000 lbs. of rye and an initial saving of 75 per cent of the seed usually required are claimed for

this method. The Zehetmayr modification of this system consists of sowing in furrows which are later filled in around the plants instead of transplanting.

Although the author's work with wheat in India along these lines was destroyed by ants, he says that corn planted in furrows about 5 in. deep gave about 1⅔ times as great yields as that sown on the level.

Earthing up was also tested for somewhat similar purposes, but gave lower results than deep transplantation.

The Demtschinsky hilling method, N. DEMTSCHINSKY (*Deut. Landw. Presse, 38 (1911), No. 25, p. 293, fig. 1*).—The author outlines the Chinese method of hilling small grains for moisture conservation and the development of the root system. He recommends an implement manufactured in Magdeburg with which a man and horse can hill from 6 to 7 hectares (14.82 to 17.29 acres) of grain per day.

Insuring increased yields—the theory and practice of the Demtschinsky methods for growing small grains, N. A. and B. N. DEMTSCHINSKY (*Die Vervielfachung und Sicherstellung der Ernteerträge, Theorie und Praxis der Ackerbeetkultur. Berlin, 1909, pp. 116, pls. 12, figs. 10*).—A discussion of the theory underlying the authors' new methods is followed by directions for their use in grain growing and a statement of the results of tests and observations at Torbino and of other tests of transplanting and hilling methods.

[Tests of the Demtschinsky method], G. BOHUTIGNSKY (*Illus. Landw. Ztg., 31 (1911), Nos. 3, pp. 13, 14; 5, pp. 29–31, figs. 3*).—The author summarizes the results of experiments with winter wheat, winter barley, and oats conducted in 1909–10. Tables state in detail the results obtained by the ordinary method, and the deep sowing, hilling, and Zehetmayr modifications of the Demtschinsky method.

From the data presented the author concludes that hilling produces a greater production per plant which may compensate for the loss due to thinner seeding. The use of the Demtschinsky method prolonged the vegetation period by from 3 to 8 days, but increased the danger from rust. The new methods gave a higher yield per plant but not per acre than the ordinary method. The deep planting method gave negative results.

Tests of the new grain cultural methods of Demtschinsky and Zehetmayr, O. LEMMERMANN ET AL. (*Landw. Jahrb., 41 (1911), No. 2, pp. 163–256*).—These tests were conducted at Hohenheim on the experiment fields of the Royal Agricultural High School of Würtemberg. The author states in tables the results obtained since 1908 in work with winter rye, barley, wheat, and oats, as well as with some summer varieties.

From the data presented he concludes that thin sowing resulted in unusual tillering, but no marked difference appeared in the tillering of grains that were hilled or planted more deeply than usual. The use of the Zehetmayr method resulted in tillering about midway between that following the Demtschinsky and the ordinary methods. Tillering was most affected in case of winter barley, less so in case of winter rye and winter wheat, and least of all in case of summer barley.

Both methods apparently retarded ripening by from 3 to 10 days. The Demtschinsky method resulted in a greater retardation than did the Zehetmayr, but if the plants were more deeply set later a more regular development of the straw, and therefore a more regular ripening of the grain, was attained than if this work were left undone. The Demtschinsky method more effectively prevented lodging, the Zehetmayr method accomplishing this to a lesser degree.

The grain and straw yields per plant were effectively raised by the Demtschinsky method as compared with the ordinary method, especially in case of winter barley. The Zehetmayr method gave results midway between. The

Demtschinsky method gave lower yields when hilling and transplanting were resorted to than when they were omitted. The Demtschinsky method and to a less degree the Zehetmayr method increased the percentage of grain, the 1,000-kernel weight, and the size of kernel. All things considered, the author believes that on the heavy clay soil used in the test only the Zehetmayr method compared favorably with carefully conducted drilled seeding by the older method. He regards transplanting as impractical for extensive agriculture, and states that it brings lower yields than the ordinary drill seeding method.

Compilation of the results of tests of the Demtschinsky, Zehetmayr, and other cultural methods and their variations, A. EINECKE (*Landw. Jahrb., 41 (1911), No. 2, pp. 281–335, fig. 1; abs. in Jour. Bd. Agr. [London], 18 (1912), No. 10, pp. 857–859*).—This article is compiled from reports transmitted by the minister of agriculture of the Prussian Agricultural Chambers to the experimental and bacteriological institute of the Royal Agricultural High School. Much of the data presented has already been published, and has been noted from other sources.

The results obtained in these experiments, which were carried out in Germany, agreed fairly well, indicating that transplanting and deep setting of cereals is unprofitable. Although Demtschinsky estimates that from 16 to 20 days' labor per acre is sufficient in the use of this method, the extra labor required in these experiments varied from 53 days per acre in Pomerania to 120 days in Wiesbaden.

The results favored hilling up the plants in rows and indicated that this method prevented lodging without involving much extra labor. A special machine was used in planting. The effect of these treatments varied somewhat with the different cereals. Both earthing up and transplanting were favorable in case of winter rye on sandy and clay soils, but winter wheat was less favorably affected and the tests on spring rye were unsuccessful. Both these methods gave good results in 2 experiments on spring barley, but the results with oats were too variable to justify definite conclusions.

In general the Demtschinsky method resulted in longer heads and a greater production of grain per plant than the ordinary methods, and although unsuccessful financially, it drew the attention of German agriculturists to the possibilities of deep plowing and earlier, thinner seeding.

Tests of new grain culture methods, R. FRUWIRTH (*Wiener Landw. Ztg., 61 (1911), No. 33, pp. 385–387*).—This is a report of experiments conducted to determine the merits of hilling up wheat, rye, and barley, and of covering the small plats with soil, as compared with the ordinary cultural methods. Tables state the weight of grain per 100 heads, the 1,000-kernel weight, the proportions of the kernels which passed through sieve meshes of various sizes, and the depth of drilling and covering.

In view of these and other tests the author does not feel that the recent severe criticism of these methods is any more justified than the earlier enthusiasm. He does not recommend any diminution in rate of seeding when they are used.

[Experiments with field crops], G. AUCHINLECK (*Imp. Dept. Agr. West Indies, Rpts. Bot. Sta. [etc.] Grenada, 1910–11, pp. 4–6*).—In experimental sowings of *Crotalaria retusa*, indigo, Bambarra ground nuts (*Voandzeia subterranea*), *Tephrosia candida*, and the sword bean (*Canavalia gladiata*), only the last named germinated well under a cacao shade. Variety tests of sweet potatoes, yams, and tanias are reported. The quantity of seed set on both limed and unlimed rows of alfalfa was negligible and no apparent increase resulted from the tripping of alternate rows.

[Field crop tests in the Fiji Islands], C. H. KNOWLES (*Rpt. Agr. Fiji, 1910, pp. 8–11*).—Brief reports are given on work at the Lautoka Station with cotton planted continuously, and cotton planted after corn, rice, and green manure crops. The cost of lint per pound ranged from 8s. 9d. to 13s. 8d. Other work reported included a fertilizer test with cotton, a date of cutting test with sisal hemp, a variety test of corn, and a test of a rice huller and polisher. The cost per bushel of growing corn of the 4 varieties tested ranged from 1s. 2d. to 2s. 2d.

[Variety and other tests], J. W. HADFIELD (*Agr. Gaz. N. S. Wales, 23 (1912), No. 2, pp. 115–121, figs. 5*).—Tests of varieties of wheat, oats, and mixed sowings of barley with rape and vetch are reported. Barley and rape proved the most effective winter mixture.

[Tests of new grasses], J. DUNCAN (*Jour. New Zeal. Dept. Agr., 4 (1912), No. 2, pp. 111, 112*).—*Festuca duinetorum* is noted as giving special promise of proving a valuable grass at Kaitaia and Okerama in the Whangarei district. Other grasses tested were *F. arenari, Agropyrum smithii, A. repens, Phalaris commutata, P. caroliniana, Paspalum dilatatum, P. virgatum,* and *Chloris gayana.*

The influence of time of cutting upon the yield and composition of hay, C. CROWTHER and A. G. RUSTON (*Jour. Agr. Sci., 4 (1912), No. 3, pp. 305–317*).—The author presents mechanical and chemical analyses of the soil of the Yorkshire farm on which the hay used in these experiments was grown in 1909–10. The hay was a mixture of rye grass and rib grass with various clovers.

In 1909 the first cutting was made June 10 when the rye grass was in full flower and later cuttings on June 28, July 15, and August 3. Analyses of the hay indicate that the proportion of crude fiber increased steadily throughout the entire period, that the proportion of amids fell gradually up to the third cutting after which the reduction was very pronounced, and that a fall in proportion of true protein during the moist latter half of June was followed by a steady rise up to the time of the fourth cutting. The proportion of carbohydrates gradually fell after the second cutting, but the proportion of pentosans was relatively high throughout the period. The ash increased in richness in silica, but the proportion of potash and phosphoric acid tended to fall. Tables state in detail the numerical data obtained in the tests, and the author concludes from the 2 years' work that the nature of the changes depends upon the character of the season.

In 1909, when the season favored steady growth, the production of protein and fiber was steady and the assimilation of each of the ingredients, particularly silica, was considerable. In 1910, a severe climatic setback in the latter part of June was followed by an almost complete suspension of growth and notably of protein production. During both seasons there was a steady fall in the digestibility of hay, which in the end more than counterbalanced the increase in yield.

The best results followed cutting about July 1, but a latitude of a week or 10 days "may be allowed, however, without very seriously impairing the nutritive value of the crop." After July 15, however, appreciable deterioration occurred.

Tests on natural pastures, C. DUSSERRÉ (*Ann. Agr. Suisse, 12 (1911), No. 2, pp. 155–162*).—These pages report the results of fertilizer tests on natural pastures conducted for a number of years at each of several points in the cantons of Neuchatel and Valais, Switzerland.

Applications of (1) 576 kg. per hectare (512.64 lbs. per acre) of 14 per cent Thomas slag, (2) 240 kg. per hectare of 60 per cent chlorid of potash, and (3) the 2 applications together ranked in the order named in one locality as to net profits. In another locality applications of (1) 400 kg. of a 30 per cent potash salt, (2) 480 kg. of 17 per cent superphosphate, and (3) the 2 applications to-

gether gave crops containing 11.3, 10.7, and 12 per cent of protein, respectively, as compared with 10.5 per cent for the crop grown on the check plat. The net profits in this locality were lowest in case of the application of potash alone and highest in case of the mixture.

Nitrogen fertilization of legumes, G. RITTER (*Centbl. Bakt. [etc.], 2 Abt., 29 (1911), No. 23–25, pp. 650–668, pls. 2*).—The author briefly reviews earlier experiments on the subject and states at length the plan and results of his own tests with lupines.

He concludes that uninoculated virgin soil should be fertilized with nitrates or ammonium salts. A small amount of some nitrogen-supplying fertilizer should be added even when inoculation with pure cultures is practiced, but the best results are obtained by inoculation with soil from fields in which lupines have grown.

The soy bean and cowpea, C. G. WILLIAMS and F. A. WELTON (*Ohio Sta. Bul. 237, pp. 241–261, figs. 2*).—Discussions of the uses of soy beans and cowpeas accompany directions for growing and harvesting the crops in Ohio.

Seeding soy beans at the station at the rate of 3 pk. per acre produced higher total and higher grain yields than seeding at the rate of 1, 2, or 4 pk. per acre in rows 28 in. apart. Seeding at the rate of 8 pk. per acre in rows 8 in. apart produced a still higher forage yield but the difference was insufficient to pay for the extra seed used. The forage was more satisfactory because of fineness of stems. Sowing at the rate of 3 pk. per acre also gave the highest grain yield in a farmer's cooperative test.

Tables present descriptions of 32 varieties of soy beans tested and the yields secured during the period 1908–1911. Other tables group these varieties according to the length of the period required to ripen them, and report analyses as to protein and fat of 23 varieties of soy beans and 2 varieties of cowpeas in comparison with other feeds.

During the 3-year period 1909–1911, 10 varieties of soy beans produced average total yields of 3,528 lbs., and grain yields of 23.62 bu. of grain per acre. During the same period 3 cowpea varieties produced total yields ranging from 2,380 lbs. to 3,080 lbs. and grain yields ranging from 4.44 to 7.94 bu. per acre.

Alfalfa as a field crop in South Dakota, A. N. HUME and S. GARVER (*South Dakota Sta. Bul. 133, pp. 259–281, figs. 6*).—Tables state the results obtained in numerous variety tests at Brookings, Highmore, and other points in cooperation with the Bureau of Plant Industry of this Department.

From the data presented, the authors conclude that there is nothing to indicate that the source of the seed used at Brookings had any considerable influence on the hay yield, with the possible exception of the French seed. At Highmore, however, 6 years' average yields indicate that a choice of the proper strain may determine success or failure. Of the 4 strains that appeared sufficiently hardy for use at this point, "Turkestan proved most able to withstand conditions." It gave an average yield of 1.4 tons per acre during the 6 years.

In a test of strains of *Medicago sativa*, *M. falcata*, *M. media*, *M. ruthenica*, and *M. platycarpa* at Brookings, Highmore, and Cottonwood, plants which had been reset were compared. Almost all the strains tested at Brookings proved sufficiently hardy, but at Highmore a far greater percentage of the reset plants of *M. falcata* survived than of *M. sativa* or even *M. media*. At Cottonwood the surviving plants were practically all either *M. falcata* or *M. ruthenica*.

Hard seed was treated by a machine devised by Nilsson of Svalöf, Sweden. This is called the "Preparator," and consists essentially of a hopper so arranged as to drop the seed upon a revolving disk from which it is thrown by centrifugal force against the concave surface of a circular rough stone within which the disk revolves. On striking the rough surface, the seed coats are in-

dented or scratched and so weakened that water is more readily absorbed and the seed coat more easily broken by the swelling germ. Treated and untreated seed of *M. sativa* showed germination tests of 99⅛ and 91⅛ per cent, respectively, as compared with 94 and 86½ for *M. media*, and 81¼ and 62¾ for *M. falcata*.

Right- and left-handedness in barley, R. H. COMPTON (*Proc. Cambridge Phil. Soc., 15 (1910), No. 6, pp. 495–506, figs. 2*).—The author's conception of right- and left-handedness in barley is illustrated in the accompanying figure (see fig. 1).

Observations of 8 varieties of two-rowed barley made to determine the ratio of lefts to rights in the first leaves of seed of different varieties, and of the various kernels from the same individual spikes, indicated that among 12,401 seedlings 7,237, or 58.36 per cent, "had the first leaf twisted in the left-handed fashion." The ratios obtained from the different varieties differed slightly, and "it appears probable that the difference between Plumage corn, and Guinness Goldthorpe, for example, is significant." Right- and left-handedness appeared not to be hereditary.

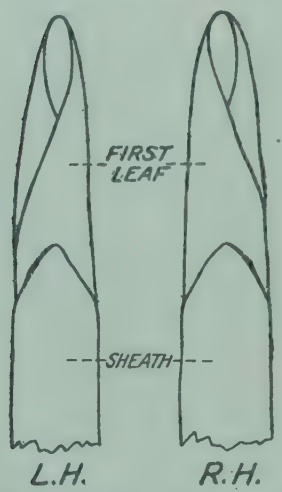

FIG. 1.—Right- (R. H.) and left-handed (L. H.) stereo-isomeric seedlings.

The same ratio was maintained whether the seed was taken from the odd or even rows of seed on the parent ear. The twist of the last leaf below a spike had no apparent influence on the ratio of right- to left-handed seedlings produced from the spike.

A further contribution to the study of right- and left-handedness, R. H. COMPTON (*Jour. Genetics, 2 (1912), No. 1, pp. 53–70, figs. 4*).—The work reported in this paper confirms the conclusions noted above in the case of two-rowed barley, indicating that "although the ratio of lefts to rights is maintained through 3 successive generations, the kind of asymmetry itself is not inherited." An excess of left-handed seedlings also appeared in six-rowed barley and no conspicuous variation of the ratio of lefts to rights among the different rows of grain appeared. The numbers examined, however, were too small to be decisive.

A variety of millet (*Setaria italica*) also showed an excess of left-handed seedlings, 54.1 per cent being left-handed. Both stereo-isomeric forms were present in rye. In case of corn the ratio was almost unity (1.010), and there was apparently "no inheritance of right- and left-handedness as such." In case of oats 44.88 per cent of the seedlings were right-handed. The ratios obtained in case of corn kernels varied according to the position of the kernel on the cob, "the seeds on the odd orthostichies giving an excess of right-handed, those on even rows an excess of left-handed offspring" with some exceptions.

The author suggests that the difference in ratios results from a difference in shape of the material enclosing the developing embryo, and rejects as improbable an alternative hypothesis involving somatic segregation of symmetry characters in the gametes.

Chou moellier at Moumahaki (*Jour. New Zeal. Dept. Agr., 4 (1912), No. 2, pp. 117, 118, fig. 1*).—Although this is the first test of chou moellier for this purpose at this locality, the author regards it as a decided success as a dry weather forage for milking stock.

[Root cotton], S. KUSANO (*Jour. Col. Agr. Imp. Univ. Tokyo, 4 (1911), No. 1, pp. 67–82, pls. 2, fig. 1*).—This so-called cotton is a fibrous cork tissue derived from the root of the tropical plant *Fagara integrifoliola*. It is at present used in caulking the seams of small boats. It is spoken of as unwettable, but takes up 16.2 per cent of its own weight in water when kept in a moist chamber for a week (maximum temperature 22° C.) or 26.1 per cent when kept in a steam sterilizer for 3 hours and left until the next day, as compared with 15.2 and 20.2 per cent respectively in case of ordinary commercial cotton. Its specific gravity is only about half that of ordinary cotton.

The bast fibers of Gomphocarpus fructicosus, A. HERZOG (*Tropenpflanzer, 16 (1912), No. 3, pp. 113–125, figs. 8*).—A brief review of the literature of the subject is followed by a statement of the results of observations of the water content and of the microscopic and other characters of the fibers. Tables state the results of measurements of the cells and micro-photographs show the structure of the fibers.

The origin of cultivated oats, TRABUT (*Bul. Soc. Hist. Nat. Afrique Nord, 1910, No. 9, pp. 150–161, figs. 5*).—This contribution to the study of the origin of cultivated oats deals with *Avena sterilis*, *A. fatua*, and *A. barbata*.

A comparative test of lime-sulphur, lead benzoate, and Bordeaux mixture for spraying potatoes, F. C. STEWART and G. T. FRENCH (*New York State Sta. Bul. 347, pp. 77–84, pls. 4*).—The experiments described were conducted for the purpose of determining the relative merits of lime-sulphur 1:40, lead benzoate (1 lb. to 50 gal.), and Bordeaux mixture (6:6:50) for spraying potatoes.

The authors conclude that "the results indicate plainly that neither lead benzoate nor lime-sulphur can be profitably substituted for Bordeaux mixture in spraying potatoes. Both lack the stimulative influence possessed by Bordeaux while lime-sulphur also dwarfs the plants and lowers the yield."

The Bordeaux rows yielded 100.3 bu. per acre more than the checks, while the benzoate and lime-sulphur rows yielded respectively 6 and 39.5 bu. less than the checks. None of the mixtures burned the foliage, but the lime-sulphur rows were as badly affected with tip burn as were the check rows.

Lime-sulphur dwarfs potato plants, F. H. HALL (*New York State Sta. Bul. 347, popular ed., pp. 2, fig. 1*).—This is a popular edition of the above.

Soy beans, G. ROBERTS and E. J. KINNEY (*Kentucky Sta. Bul. 161, pp. 107–131, figs. 2*).—This is a brief manual of information for the soy bean grower in Kentucky. Notes on a number of varieties tested are given.

Three-year average yields after planting in rows 28 in. apart were not enough higher than those secured from rows 35 in. apart to pay for the extra trouble of cultivation. Sowings of 55 lbs. per acre generally excelled in seed yield those of 30 lbs. per acre.

The soy bean and its uses, A. C. TONNELIER (*La Soja Hispida y sus Aplicaciones. Buenos Aires, 1912, pp. 16, figs. 4*).—This brief manual of information on the soy bean quotes many authorities, and reports an analysis of the "green forage" of the plant and the yield secured in a test which the author regards as favorable to the growth of the plant in his locality.

Tobacco culture in Ohio, A. D. SELBY and T. HOUSER (*Ohio Sta. Bul. 238, pp. 263–359, figs. 23*).—Earlier tobacco work at the Ohio Station has already been noted (E. S. R., 16, pp. 870, 886; 17, p. 245; 18, p. 696). This bulletin discusses the early history of tobacco culture in Ohio, and gives statistical and other studies on its present status and directions for tobacco growing, harvesting curing, and marketing in that State.

In a rate of planting test the plants were spaced 16, 20, 24 in. etc. up to 40 in. apart in rows 34 in. apart. Those planted 16 in. apart gave the highest yields

per acre of filler, wrapper, and trash. The decrease in yield and in total value per acre resulting from wider plantings was continuous. The most closely planted tobacco was rather flimsy, perhaps because of immaturity and delayed ripening, but the fact that the entire crop was harvested at the same time was probably unfair to the closer plantings as these were somewhat less mature.

During the years 1906 and 1907 the total average gain from suckering as compared with allowing the crop to go without attention until cutting time amounted to 340 lbs. per acre or $36 per acre. In 1910 the gain amounted to 193 lbs. or $20.07 for twice suckering, and 247 lbs. or $24.53 in case of that suckered 3 times.

In tests of time of harvesting Zimmer Spanish tobacco in 1909, that which was allowed to stand 25 and 27 days after topping gave 18.81 per cent greater total weight than that which stood only 20 and 22 days. The gain in wrapper and filler was 13.28 and that in total value 14.23 per cent. In another test tobacco cut 23 and 27 days after topping gave 12.94 per cent greater total weight than that cut 2 days sooner, 9.21 per cent loss in wrapper and filler and 5.56 per cent loss in total value. In a third test a crop which stood 27 days showed 6.61 per cent greater total weight than that which stood only 22 days, 4.44 per cent gain in wrapper and filler and 4.92 per cent gain in total value, while that which stood 32 days showed gains of 10.62, 10, and 10.11 per cent, respectively.

In 1910 cuttings were made 2, 3, 4, 5, and 6 weeks after topping. The increase in yield of wrapper and filler and in total value was continuous up to the last cutting. In case of 3 hybrids cut in part 4 weeks after topping and in part 4 days later distinct gains in yield and value were observed. These hybrids were top suckered just before the first cutting.

Among 34 varieties and hybrids Pennsylvania Broadleaf and Black Seedleaf produced the highest average yields during 1908–1910. Tables indicate also the yields secured in 1910 and the relative merits of hybrids and varieties based upon the yields of their best selections in 1910.

A table presents an itemized statement of the cost of each of 13 operations in connection with growing and marketing tobacco as carried on by 7 Zimmer Spanish growers. The author calls attention to the fact that many factors in cost of production remain constant or nearly so and that the important point is not the cost of production per acre but the production cost per unit of product. He estimates that while the 7 farmers quoted spent $44.94 on the operations specified and secured average profits of $47.92, an expenditure of $60 per acre might bring a profit of $65 per acre. A table indicates the recommended distribution of the expenditure among the various operations.

Historical and cultural notes on Zimmer Spanish tobacco are followed by briefer notes on a number of other varieties.

[Tobacco varieties and tests in Imosk and Sinj], K. Preissecker (*Fachl. Mitt. Österr. Tabakregie, 11 (1911), No. 2, pp. 63–86, pls. 5, figs. 3; abs. in Bol. Tec. Coltiv. Tabacchi [Scafati], 10 (1911), No. 5, pp. 283–294*).—A statement of the principal tobacco varieties grown in Dalmatia and of data obtained in tests of a number of hybrids accompanies discussions of the commercial status of tobacco in Bosnia, Herzegovina, and Japan.

The use of artificial heat in curing cigar-leaf tobacco, W. W. Garner (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 241, pp. 25, figs. 4*).—This bulletin presents in popular form some results of several years' experiments in the Connecticut valley.

These tests have proved "that by the use of artificial heat the curing can be successfully accomplished during the most unfavorable weather conditions, and methods for accomplishing this end are outlined." Heretofore the application of artificial heat in curing cigar tobaccos has been restricted almost en-

tirely to the use of open charcoal or wood fires in curing shade-grown wrapper leaf. Experiments on a commercial scale in cooperation with growers have demonstrated the value of artificial heat in general for curing cigar types. A method of applying heat by the use of a furnace and flues, which has given very satisfactory results, has been worked out in detail.

The topics discussed include the conditions essential to the changes in properties and composition during the process, the prevention of pole-sweat, or pole-burn, the effect of the use of artificial heat on quality, the use of charcoal and flues in curing, and the construction of barns adapted to the use of heat.

[Tobacco hybrid and Mendelian inheritance], V. PAOLINI (*Bol. Tec. Coltiv. Tabacchi [Scafati], 10 (1911), No. 5, pp. 268–272*).—The author discusses a local tobacco hybrid with special reference to Mendelian inheritance. This "Salento" hybrid was produced by crossing 2 varieties designated as Kentucky and Cattaro.

[Seed analyses and plant breeding at Zurich], F. G. STEBLER (*Landw. Jahrb. Schweiz, 26 (1912), No. 1, pp. 16*).—This report presents data for 1910 similar to the report already noted (E. S. R., 23, p. 239).

Agricultural observations in North America, with special reference to plant breeding, K. VON RÜMKER and E. VON TSCHERMAK (*Landw. Jahrb., 39 (1910), Ergänzungsb. 6, pp XVI+151, pls. 22*).—This is a review of the various lines of research in plant and animal breeding in North America, especially in plant breeding, together with a brief account of the agricultural institutions of the United States and descriptions of typical agencies.

Organization for plant breeding, K. VON RÜMKER (*Ueber Organisation der Pflanzenzüchtung. Berlin, 1909, pp. 56*).—The author discusses the organization of the plant-breeding work conducted in Vienna, Loosdorf, Weihenstephan, Munich, Hohenheim, and Svalöf. References are given to other publications which deal with the work at some of these points.

HORTICULTURE.

Influence of crossing in increasing the yield of the tomato, R. WELLINGTON (*New York State Sta. Bul. 346, pp. 57–76*).—This comprises a study of the effect of cross-fertilizing related tomato varieties on the yield of the hybrid plants. Some of the more important experiments in plant hybridization are reviewed and a bibliography is appended. Suggestions are given for growing hybrid seed.

The experiments were conducted in the summers of 1908–1910 and also in the winter of 1908–9. The first experiment was started with seed from self-fertilized plants of the Livingston Stone and Dwarf Aristocrat and from Dwarf Aristocrat × Livingston Stone, and Dwarf Aristocrat × Hedrick. The yield from the first generation (F_1) seedlings resulted in a marked increase over the yield of the parent forms. Similar results were secured with F_1 seedlings in the summers of 1909 and 1910. The 1908–9 winter experiment comprised a test of F_2 seedlings, all of the dwarf plants that appeared in this second generation being discarded. The results were similar to those secured in F_1 summer tests although the differences in favor of the crosses were much less marked.

The summer experiment in 1909 was conducted with F_1, F_2, and F_3 seedlings. The F_1 and F_2 seedlings showed practically the same increase in yield over the parent forms, whereas the yield of F_3 seedlings was nearly identical with the Livingston Stone parent. The experiment in 1910 was continued to the fourth generation of seedlings. The F_1 seedlings gave the highest yield, the F_2 seedlings the next highest, whereas the F_3 and F_4 seedlings both gave yields considerably

lower than the Livingston Stone parent. In all cases the yield of the standard parent was much greater than that of the dwarf parent.

In the light of this and similar investigations here reviewed, the author concludes that the increase in vigor and size produced by crossing is undoubtedly due either to the heterozygous condition, which stimulates the growth of either the size or the number of cells, or to a combination of two or more size-increasing characters, such as thick internodes and long internodes, which dominate over characters of decreasing dimensions. All of the crosses gave consistent gains in favor of the yield of F_1 seedlings. The yields from the F_2 and F_3 seedlings appear to have fallen off in direct ratio to the decrease in the number of heterozygous plants. When, however, a homozygous condition for all the plants in a strain has been obtained, the average yield of the plant should remain constant from year to year, varying only with the external factors. The author further concludes that the results as a whole warrant the production of F_1 generation tomato seed, not only by the growers but by all seedsmen who wish to furnish the best grade of seed to the buyers.

Crossing tomatoes to increase the yield, F. H. HALL (*New York State Sta. Bul. 346, popular ed., pp. 8*).—A popular edition of the above.

Preliminary report on tomato culture, L. L. CORBETT (*Virginia Truck Sta. Bul. 8, pp. 157–171, figs. 5*).—This comprises popular directions for growing tomatoes in eastern Virginia. Consideration is given to propagation, including the use of the hotbed and cold frame; hardening; soil and preparation; planting; spraying; diseases and insects; types of fruit; harvesting and packing; marketing; and canning. Results are also given of varieties tested at the station showing the character of growth, form and color of fruit, date of first ripening, duration of picking period, and number and weight of fruit.

[Phenological notes: Blooming dates for Iowa plants, 1911], CHARLOTTE M. KING ET AL. (*Trans. Iowa Hort. Soc., 46 (1911), pp. 200–211*).—A continuation of previous reports (E. S. R., 26, p. 237). The records for 1911 are given by a number of observers from different parts of the State showing the dates of first blooming of trees, shrubs, and flowering plants.

The avoidance and prevention of frost in the fruit belts of Nevada, J. E. CHURCH and S. P. FERGUSSON (*Nevada Sta. Bul. 79, pp. 58, pls. 16*).—Part 1 of this bulletin, which deals with the prevention of frost, describes in detail heating experiments conducted by the station in 3 orchards during the spring season of 1911, and discusses methods of preventing frost by the use of windbreaks and orchard heaters. A brief account is given of frost phenomena and general weather changes, together with a discussion of the methods of forecasting frost, including descriptions with illustrations of the necessary apparatus. Estimates are also given on the cost of orchard heating.

The second part of the bulletin deals with the avoidance of frost. A series of temperature measurements taken in 1910 are given to show the value of higher ground as a natural site for orchards. A temperature survey of the agricultural land of the State has been inaugurated with the view of determining large areas suitable for fruit raising under all forms of economic frost prevention and also to delimit thermal belts in these areas into (1) belts where frost does no material damage to fruit crops; (2) belts where frost can be successfully combated at reasonable expense; and (3) belts where frost is so severe as to make fruit raising unprofitable. A progress report is given of this work, which during the past season included the establishment of 5 different stations in the Truckee Meadows and located at different altitudes. The temperature records secured at these stations are given and discussed. They indicate a preponderance of low temperatures at the lower stations.

A preliminary temperature survey of the State covering the years 1901–1911 and based upon the climatological records of the U. S. Weather Bureau was also made. Descriptions are given of the thermal stations in Nevada with mean temperature observations during the above period, together with similar data for Utah and Colorado. A bibliography on orchard heating, together with suggestions on tree planting by A. A. Heller, is appended.

The authors conclude that orchards in Nevada can be protected, even during a season when the temperature falls as low as 22° F. and frosts occur persistently, at an expense varying from 73 to 95 cts. per tree. Windbreaks consisting of the Russian oleaster, lopped poplars or willows, and Lombardy poplars are recommended as a material aid in economic and effective orchard heating. The windbreaks are essential to success wherever the wind is strong. From the temperature data already secured it is concluded that many sections in Nevada contain areas that can be adapted by orchard heating to the raising of fruit. The Moapa Valley is practically frostless.

Varieties of fruits raised in Oklahoma, N. O. Booth and D. C. Mooring (*Oklahoma Sta. Bul. 95, pp. 3–48*).—A descriptive list is given of the varieties of apples, crabapples, pears, quinces, peaches, plums, cherries, grapes, blackberries, dewberries, loganberry, raspberries, strawberries, and gooseberries, which have been tested by growers in Oklahoma. The number of growers who have been successful and those who have been unsuccessful with each variety are indicated.

How to make old orchards profitable, F. A. Bates (*Boston, 1912, pp. 123, figs. 13*).—A popular treatise on orchard renovation.

The apple orchard from planting to bearing age, A. L. Dacy (*West Virginia Sta. Bul. 136, pp. 161–206, figs. 23*).—A popular bulletin discussing the various operations involved in planting an apple orchard and in its subsequent care up to the bearing age.

The profitable management of the small apple orchard on the general farm, M. C. Burritt (*U. S. Dept. Agr., Farmers' Bul. 491, pp. 22, figs. 8*).—This bulletin deals specifically with the renovation of old apple orchards. After classifying the orchards it will not pay to renovate, the details are given for pruning, fertilizing, cultivating, and spraying neglected orchards, including a discussion of the cost and profits from renovated orchards. Important references to the subject of orchard renovation are noted.

The more important insect and fungus enemies of the fruit and foliage of the apple, A. L. Quaintance and W. M. Scott (*U. S. Dept. Agr., Farmers' Bul. 492, pp. 48, figs. 21*).—This publication, which is based upon the results of the Department's investigations during the past several years, describes the more important insect and fungus enemies of the fruit and foliage of the apple, together with the most economical methods of combating them.

The cherry orchard as a commercial venture, G. B. Healy (*Trans. Iowa Hort. Soc., 46 (1911), pp. 256–259*).—Some data are given on the cost of growing cherries on a commercial scale.

A supposed case of parthenogenesis among olives, G. Campbell (*Nuovo Gior. Bot. Ital., n. ser., 19 (1912), No. 1, pp. 86–89, pls. 2*).—The author reports a case of supposed parthenogenesis observed in an olive grove where abortion of the female flowers occurred quite frequently.

Strawberry notes for 1910, 1911, W. J. Green, J. H. Gourley, and P. Thayer (*Ohio Sta. Bul. 236, pp. 211–239, figs. 56*).—This bulletin contains notes on the condition and character of strawberry varieties tested at the Ohio Station during the seasons 1910 and 1911. Many of the varieties are illustrated. Lists are given of promising varieties for market, dessert, and canning, and for high yield and long-season fruiting.

A test of a number of autumn fruiting varieties indicates that the smallness of the fruit renders these varieties of little commercial importance, although they are worthy of consideration in the home garden.

In a test of hill culture versus the matted row system, the hill grown berries averaged 1½ days earlier for the first picking and 7 days earlier for the last picking. The quality was unaffected by the method of culture.

Strawberry culture, G. MARTELLI (*La Coltivazione delle Fragole. Catania, 1912, pp. 51, figs. 11*).—A popular treatise on the history, botany, culture, and uses of the strawberry.

The cherimoya in California, with notes on some other anonaceous fruits, F. W. POPENOE (*Pomona Col. Jour. Econ. Bot., 2 (1912), No. 2, pp. 277–300, figs. 16*).—The cherimoya (*Anona cherimolia*) is here described with reference to its botany, origin, common names, climatic requirements, propagation, culture, diseases, insect pests, season, shipping qualities, nature and extent of seedling variation, and varieties, together with information relative to the present status of its culture in California. Other species of Anona fruited in California, as well as all of the anonaceous fruits introduced there, are also described.

Feijoa sellowiana, its history, culture, and varieties, F. W. POPENOE (*Pomona Col. Jour. Econ. Bot., 2 (1912), No. 1, pp. 217–242, figs. 13*).—The Feijoa, a comparatively new fruiting shrub from South America which gives promise of thriving throughout the warm sections of the United States, is here discussed relative to its history, botany, introduction and trial in various parts of Europe and North America, methods of propagation, climatic requirements, culture, season, the fruit and its uses, keeping and shipping qualities, diseases and insect pests, and variation and varieties.

Wild fruits which ought to be cultivated, C. E. BESSEY (*Nebr. Hort., 2 (1912), No. 4, pp. 1, 5–8*).—The author discusses somewhat in detail a number of wild fruits of Nebraska which are considered worthy of cultivation.

The palms indigenous to Cuba, I, O. BECCARI (*Pomona Col. Jour. Econ. Bot., 2 (1912), No. 2, pp. 253–276, figs. 10*).—This is a contribution to the knowledge of the palm flora of Cuba. The present part contains a conspectus of the genera and conspectuses of the Oreodoxa, Pseudophoenix, and Gaussia.

[Cacao manurial plats in Dominica], H. A. TEMPANY (*Imp. Dept. Agr. West Indies, Rpts. Bot. Sta. Dominica, 1910–11, pp. 22–32*).—This is a progress report on the fertilizer and mulching experiments being conducted with cacao at the Dominica Botanic Station, including the results of fertilizer experiments conducted in several country districts. The results as a whole confirm those previously noted (E. S. R., 24, p. 545).

Spices, H. N. RIDLEY (*London, 1912, pp. IX+449, figs. 15*).—A handbook of information relative to the history, cultural requirements, exploitation, and uses of the following spices and condiments: Vanilla, nutmegs and mace, cloves, pimento or allspice, cinnamon, cassia bark, massoy bark, black peppers, long pepper, grains of paradise, cardamoms, capsicums or chilies, coriander, dill, cumin, ginger, turmeric, zedoary, galangal, and calamus root.

Everblooming roses, GEORGIA T. DRENNAN (*New York, 1912, pp. XII+250, pls. 16*).—A popular work treating of the culture, habits, characteristics, care, nativity, and parentage of roses, with authentic guides to the selection of everblooming varieties.

Preparation and use of the concentrated lime-sulphur spray, J. P. STEWART (*Pennsylvania Sta. Bul. 115, pp. 3–23, figs. 3*).—This bulletin, which replaces Bulletin 99 (E. S. R., 23, p. 266) of the same series, brings the results and recommendations relative to the preparation and use of concentrated lime-sulphur spray up to date.

On the occurrence of arsenate of lead in the wine, lees, and seeds obtained in vineyards treated with arsenate of lead, P. CARLES and L. BARTHE (*Bul. Soc. Chim. France, 4. ser., 11 (1912), No. 8, pp. 413–417*).—Analyses of wines taken from vines sprayed with an excess of arsenate of lead showed only slight traces of arsenic and of lead. No arsenic or lead were found in wines obtained from vines normally treated. Larger amounts of arsenic and of lead were found in the lees of grapes receiving arsenical sprays, however, and the authors conclude that where the wines contain an undue proportion of lees a certain amount of the arsenic and the lead will occur in the wine. The danger of poisoning from this cause, however, is not considered serious.

FORESTRY.

Second-growth hardwoods in Connecticut, F. H. FROTHINGHAM (*U. S. Dept. Agr., Forest Serv. Bul. 96, pp. 70, pls. 6, figs. 3*).—This comprises the results of a study conducted cooperatively by the Forest Service and the Connecticut State Station to determine the rate of growth of second-growth hardwoods in Connecticut, the value of the standing timber for different uses, and the method of management to secure the maximum yield of most valuable material in the shortest time.

Part 1 deals with the present forest conditions in Connecticut, including a description of the second-growth types. Part 2 discusses methods of selling timber, market values and uses of native forest products, logging costs, and value of standing timber for different uses. In part 3 the factors which influence the yield of even-aged hardwood stands are discussed. General yield tables, together with yield tables for cordwood, lumber, ties, and poles are given with directions for their use. Growth tables for average even-aged hardwood stands are also included. In part 4 the management of hardwood stands is discussed under the general headings of choice of species, factors influencing rotation, thinnings, final cutting and reproduction, protection, and financial returns. A number of volume tables, together with tables showing the yield of individual oak and oak-chestnut stands are appended.

The testing of pine seeds, HAACK (*Ztschr. Forst u. Jagdw., 44 (1912), Nos. 4, pp. 193–222, figs. 7; 5, pp. 273–307, pl. 1*).—In continuation of previous investigations (E. S. R., 21, p. 441), extensive experiments were conducted in 1910 and 1911 to study the influence of individual germination factors, such as the time of the year when tests are made, moisture, heat, light, and chemical treatment of seed, as well as to determine the practical application of the ratio between the germinative energy of a seed sample and the number of seedlings produced therefrom in determining the market value of the sample. The experiments are described in detail, together with a discussion of their application and value as compared with methods generally used in testing pine seeds.

The author found that tests of pine, and spruce seeds as well, may be conducted at any time of the year, providing conditions favorable to germination, such as moisture, heat, and light can be provided for.

Although germination at low temperatures was found to begin later and to spread out over a longer period than at high temperatures, the relation between germination temperature and the germination duration is such that the product of the time period and the number of seedlings is practically the same whether the tests are conducted at high or low temperatures. Varying high temperatures have a stimulating effect on the germination of pine seed but not on spruce seed. This effect is somewhat similar to the effect of light exposure but not so powerful as the latter effect. A constant temperature of 25° C. is recommended for seed testing stations.

All parts of a spectrum acted favorably on the germination of pine seed, the long undulating rays being most beneficial and the short blue rays less beneficial. Spruce seed was acted on favorably only by the red and yellow light and may be directly injured by the blue light.

In making seed tests it is sufficient to germinate the seed under light conditions for a period of from 8 to 10 hours daily. The best degree of light is one in which reading can be easily done. There was no important difference between the influence of daylight and of artificial light. Daylight tests should preferably be conducted in rooms facing the north, where they will not be exposed to the direct sunlight.

Other conditions being equal the germination process of different seed samples may be traced in a curve, the latter course of which can be readily traced by accurately recording the course of the curve during the first few days after germination. For practical purposes a 12-day observation of tests conducted at 25° is considered sufficient.

Experimental rubber cultivation, J. B. HARRISON (*Rpt. Dept. Sci. and Agr. Brit. Guiana, 1910–11, pp. 8–13*).—A progress report on cultural and tapping experiments with indigenous and imported varieties of rubber yielding plants during the year 1910–11 is presented.

The rubber industry, edited by J. TORREY and A. S. MANDERS (*London [1912], pp. 470, figs. 51*).—This is the official report of the proceedings of the International Rubber Congress, London, 1911.

In addition to the matters relating to the organization and the functions of the congress the following papers were presented: Rubber in Uganda, by R. Fyffe (pp. 45–58); The Production of Rubber in Madagascar, by the colonial government of Madagascar (pp. 59–68); Lecture on the West Indies, by F. A. Stockdale (pp. 69–72); The West African Varieties of Latex and Raw Rubber, by M. C. Hugot (pp. 73–80); Rubber Plantations in French Cochin China, by A. Cremazy (pp. 81–86); Rubber Trees and Wild Rubber Reserves of the Amazon, by J. Huber (pp. 87–98); The Rubber Industry in Peru, by E. Castre (pp. 99–104); The Rubber Problem in French Western Africa, by A. Chevalier (pp. 105–119); Notes on the Planting and Production of Rubber in Ceylon, by K. Bamber (pp. 120–131); The Need of Organization in the Supply of Literature and Labor for Rubber and Other Planters, by H. H. Smith (pp. 135–141); Official Measures against Adulteration of Wild Rubber, by G. van den Kerkhove (pp. 142–148); The Maintenance of Health in Rubber Planting Districts, by W. C. Brown (pp. 149–159); The Para (Hevea) India Rubber Tree in the East, by H. A. Wickham (pp. 163–168); The Manuring of Rubber Trees, by E. Lierke (pp. 169–179); Some Diseases of *Hevea brasiliensis*, by J. Mitchell (pp. 180–189); Tapping Experiments on *H. brasiliensis*, by W. R. Tromp de Haas (pp. 190–196); African Rubber Vines: Their Cultivation and Working, by E. de Wildeman (pp. 197–209); Notes on the Cultivation of Para Rubber, by W. Fox (pp. 210–215); Some of the Constituents of *Parthenium argentatum* (Gray), The Shrub from which Comes the So-Called "Guayule Rubber," by P. Alexander (pp. 216–222); On the Physical Constitution of Caoutchouc-Bearing Latices and the Relation of the So-Called "Coagulation" thereto, by H. C. T. Gardner (pp. 225–230); The Centrifugalization of Rubber Latex, by H. S. Smith (pp. 231–233); The Discovery of the Para Reagent, by W. Pahl (pp. 234–242); Viscosity of Hevea Latex at Various Dilutions, by Miss A. T. Borrowman (pp. 243–247); Some Remarks on the Preservation of Rubber and on the Preparation of Plantation Rubber, by W. Esch (pp. 248–259); The Viscosity of Rubber and its Solutions, by P. Schidrowitz and A. H. Goldsbrough (pp. 260–264); Raw Rubber Testing, by C. Beadle and H. P. Stevens (pp. 265–284); India Rubber Research, by F. Frank (pp. 301–305); Theory of Vulcanization, by W. Hinrichsen (pp.

306–310); The Adaptation of Different Raw Rubbers for Manufacturing Purposes, by J. Jaques (pp. 311–317); The Technical Use of Plantation Rubber and the Conditions which, in the Production of Raw Rubber, are of Importance for its Technical Application, with Special Reference to Kickxia (Funtumia) and Manihot Rubber, by F. Frank (pp. 317–326); The Extensibility of Vulcanized Rubber, by C. Chénevean and F. Heim (pp. 327–335); The Oxidation of Sulphur by Nitric Acid, by H. E. Potts (pp. 336–343); Impact-Tensile Tests on Rubber and a Comparison with Tensile and Hysteresis Tests, by C. Beadle and H. P. Stevens (pp. 344–350); Mechanical Tests for Rubber, by K. Memmler (pp. 351–373); The World's Trade in Raw Rubber, by E. Hecht (pp. 377–380); and Factors Affecting the Valuation of Rubber Shares, by W. Tinnock (pp. 381–389).

Method and tables for the determination of the volume and value accretion in standing trees, E. Andersson (*Skogsvårdsför. Tidskr., 1912, Fackafd., No. 1, pp. 20–32, figs. 3*).—The derivation and use of tables for the determination of volume and value accretion are here described.

State afforestation in New Zealand, W. C. Kensington (*New Zeal. Off. Yearbook, 1911, pp. 815–824*).—The author calls attention to the need of afforestation in New Zealand and describes the work which the government has been doing along this line in recent years.

The Deliblat sand barrens in southern Hungary, E. von Ajtay (*Österr. Vrtljschr. Forstw., n. ser., 30 (1912), No. 1, pp. 43–66*).—A historical and descriptive account of afforestation and sand dune reclamation in the above named region.

A review of the results of the Saxony state forest administration for the year 1910, Vogel (*Tharand. Forstl. Jahrb., 63 (1912), No. 2, pp. 143–157*).—A statistical and financial statement of the work and results of the forest administration for 1910.

Annual report on the forest administration in Ajmer-Merwara for 1910–11, Hukam Chand (*Ann. Rpt. Forest Admin. Ajmer-Merwara, 1910–11, pp. 30*).—The annual report on the constitution and management of the state forests of Ajmer-Merwara, including a financial statement for the year. Important data relative to areas, miscellaneous forest operations, expenditures, revenues, etc., are appended in tabular form.

Progress report of forest administration in the Punjab for the year 1910–11, C. P. Fisher (*Rpt. Forest Admin. Punjab, 1910–11, pp. 3+20+LI*).—A report similar to the above relative to the administration of state forests in Punjab.

Annual report of the forest administration for the year 1910–11 (*Pflanzer, 8 (1912), Beiheft 1, pp. 42, pls. 6*).—This comprises the annual report on the constitution, management, and exploitation of the forests in the various districts of German East Africa. The important data are appended in tabular form.

DISEASES OF PLANTS.

Notes on new or little-known plant diseases in North America for 1910, F. D. Heald (*Phytopathology, 2 (1912), No. 1, pp. 5–22*).—A critical review is given of literature relating to various plant diseases reported in 1910.

Two dangerous imported plant diseases, P. Spaulding and Ethel C. Field (*U. S. Dept. Agr., Farmers' Bul. 489, pp. 29, figs. 3*).—Popular descriptions are given of the white pine blister rust due to *Peridermium strobi* and the potato black wart caused by *Chrysophlyctis endobiotica*. Both of these diseases have been introduced from Europe, the first in the importation of young pine seedlings and the second by the importation of potatoes. Thus far the potato dis-

case has been reported in North America only from Newfoundland. Attention is called to the desirability of a quarantine as a means for preventing the further introduction and establishment of these diseases.

A review of literature relating to diseases of sugar beets and potatoes, A. STIFT (*Centbl. Bakt. [etc.], 2. Abt., 33 (1912), No. 17–19, pp. 447–496*).—This is a critical review of some of the more important literature relating to the diseases of sugar beets and potatoes and their control.

The control of the loose smuts of barley and wheat, K. STÖRMER ET AL. (*Deut. Landw. Presse, 38 (1911), Nos. 88, pp. 1005, 1006; 89, p. 1017*).—A study has been made of different methods of seed treatment for the prevention of the loose smuts of barley and wheat, especial attention being given the modified hot-water method. The relation of temperature and duration of the preliminary soaking of the seed grain to the water content of the seed was investigated, and also the maximum, minimum, and optimum temperatures for the germination of the smut spores and the development of the mycelium.

It was found that the spores germinate at temperatures between 5 and 35° C. and that the mycelium begins to grow at temperatures just below 6° and growth ceases at 34°. The maximum water content of the grain, about 32 per cent, was attained in preliminary treatments of 12 hours' soaking at 6° or 4 hours at 30°. The relation of this temperature to water content is discussed at length.

As practical methods for seed treatment, based on the observations of the authors, they recommend (1) soaking barley for 12 hours at 35° and wheat at 40°, and (2) a preliminary soaking for 4 hours at from 25 to 35° for barley and wheat, after which the seed is dipped for 10 minutes in water heated to 50 to 52° for barley and 52 to 53° for wheat. In place of hot water, hot air for ½ hour may be substituted without drying the grain, 50 to 52° being maintained for barley and 52 to 53° for wheat. Where large amounts of seed are to be treated, forms of hot-air apparatus coupled with drying may be used, the temperature in the latter case falling to 40°.

Grain smuts and their control, O. BROZ (*Monatsh. Landw., 4 (1911), No. 10, pp. 289–293, figs. 4; 5 (1912), No. 1, pp. 17, 18*).—After giving a brief discussion of the various grain smuts, the author recommends three methods of treatment for infected seeds as follows:

Copper sulphate solution of 0.5 per cent strength is used to steep the grain, vigorously stirring the mass meanwhile. In the same way formaldehyde may be used, being made up to 1 or 2 per cent strength by adding to 100 liters of water 250 or 500 gm. of the 40 per cent commercial solution (formalin). The Jensen hot water treatment is preferred to the hot air treatment, and is said to destroy the mycelium which is claimed to arise from spore infection of the seed during its development in the parent flower. In the application of this treatment the grain, enclosed in very loose sacks, is steeped in water at 20° C. for 12 hours, then each sack is agitated for 1 minute in a vat at 46° and lastly for 10 minutes in a vessel at 50° to 52° in case of wheat or at from 48° to 50° in case of barley (higher temperatures will affect germination), and at once cooled in cold water and thoroughly dried. It is recommended that the seed be planted soon after treatment.

The leaf spot of oats, B. TACKE (*Mitt. Deut. Landw. Gesell., 26 (1911), No. 8, pp. 26–28; abs. in Centbl. Bakt. [etc.], 2. Abt., 31 (1911), No. 11–15, p. 321*).—The author regards the so-called dry spot of oats, as well as somewhat similar troubles with other cultivated plants, as the result of nutritive disturbances due to overliming. The remedy indicated is the employment of fertilizers relatively low in lime.

Flower infection with cotton boll rots, C. W. EDGERTON (*Phytopathology, 2 (1912), No. 1, pp. 23–27, pl. 1; abs. in No. 2, p. 98*).—The studies of Barre

(E. S. R., 22, p. 648) relating to flower infection by the fungus causing cotton anthracnose led the author to investigate the subject at some length. He claims that infection of cotton bolls following flower inoculation can take place in either of two ways. The system may grow saprophytically upon the dead flower parts and finally grow through and into the boll, or it may cause the disease by growing down through the pistil into the boll. The anthracnose probably follows both methods, while the cotton bacterium (*Bacterium malvacearum*) infects the bolls through the first method.

The author carried on a large number of inoculations in which he injected organisms suspended in water into the flowers, and determined the infection. More than half of the diseased bolls were attacked at the tip, while the percentage of infection along the lines of dehiscence was small. When the bolls are small they are readily infected with anthracnose, though, so far as the observations of the author go, no one part of the boll is more susceptible than another. It is evident that the bolls may be infected through the flowers, but the author claims that this is not the usual method of infection.

Sclerotinia panacis n. sp. the cause of a root rot of ginseng, W. H. RANKIN (*Phytopathology, 2 (1912), No. 1, pp. 28–31, pl. 1, fig. 1*).—While investigating the diseases of ginseng in 1909, the author became interested in the disease commonly known as black rot (E. S. R., 22, p. 246). Subsequent investigations showed a rather widespread infection, and specimens were collected and kept in a culture chamber at ordinary room temperature, but no growth followed.

In 1910 a further study was made and the perfect stage of the fungus discovered. This differed from the species of Sclerotinia already described. Primary infection of the roots seemed to occur at no regular place, as they were found to start either at the crowns or in smaller roots.

Control measures have not been definitely determined, but the eradication of affected roots and soil sterilization with formaldehyde or steam are recommended.

A technical description of the fungus, *S. panacis* n. sp., is given.

Infection experiments with potato fungi, H. W. WOLLENWEBER and O SCHLUMBERGER (*Mitt. K. Biol. Anst. Land. u. Forstw., 1911, No. 11, pp. 15–17; abs. in Centbl. Bakt. [etc.], 2. Abt., 32 (1912), No. 6–12, p. 315*).—The authors infected tubers with spores of *Verticillium alboatrum*, *Fusarium solani*, *F. cœruleum*, *F. orthoceras*, *F. subulatum*, and *F. discolor* by means of the Pravaz spray.

It was found that the spores of *F. cœruleum* and *F. solani* germinated in part and caused in isolated cases a slight rotting which did not extend to the whole tuber in any case. The other infections gave negative results. No decisive results were obtained by infection of stems and roots with the spores of the fungi named.

The natural distribution of Fusaria on the potato plant, H. W. WOLLENWEBER (*Mitt. K. Biol. Anst. Land u. Forstw., 1911, No. 11, pp. 20–23; abs. in Centbl. Bakt. [etc.], 2. Abt., 32 (1912), No. 6–12, p. 326*).—The author states, as the result of his investigations, that *Fusarium subulatum* and *F. dimerum* are the most common forms, attacking all organs of the host plant. The former is said to be almost omnivorous. It is found late in August in the stems which remain green, as is true also of *Verticillium alboatrum*. Those which occur most commonly on the tubers are *F. solani*, *F. martii*, *F. cœruleum*, and *F. discolor sulphureum*.

Leaf roll of potatoes, O. APPEL and O. SCHLUMBERGER (*Mitt. K. Biol. Anst. Land u. Forstw., 1911, No. 11, pp. 13–15; abs. in Centbl. Bakt. [etc.], 2. Abt., 32 (1912), No. 6–12, pp. 321, 322*).—The authors investigated the statement that enlargement of the mother tuber is a characteristic of potato plants

affected with leaf roll. It was found that such enlargement took place also in case of potatoes not so affected, lasting for about the first 4 weeks after planting.

Successive crops from planting affected tubers were found to diminish both in number and size of tubers produced until in from 4 to 7 years the results became practically nil. A few escaped from this decline and showed a tendency toward normal products, which tendency is to be more fully tested. See also previous notes (E. S. R., 21, p. 243; 22, p. 347).

Bacterial rot of potato, O. APPEL (*Mitt. K. Biol. Anst. Land u. Forstw., 1911, No. 11, pp. 12, 13; abs. in Centbl. Bakt. [etc.], 2. Abt., 32 (1912), No. 6–12, p. 319*).—It is stated that a soft rot of potato tubers is caused by *Bacterium xanthochlorum*, also that this organism causes a blackleg disease of *Vicia faba* and a stem rot of *Lupinus manus*. The author was not able to breed from *B. fluorescens*, which at 35° C. takes on pathogenic characters, a race corresponding to *B. xanthochlorum*.

Investigations with potato scab, A. BERNHARD (*Deut. Landw. Presse, 38 (1911), No. 27, p. 320; abs. in Centbl. Bakt. [etc.], 2. Abt., 31 (1911), No. 11–15, pp. 399, 400*).—Continuing previous investigations (E. S. R., 25, p. 245), the author compared results from the use of sulphur alone with those from its use in connection with lime. The all-sulphur treatment seemed the more effective.

The results obtained from planting seed potatoes affected with scab seem to forbid such use of infected tubers, while sound seed tubers in infected soil showed only sporadic infection.

Rice blight, J. L. HEWITT (*Arkansas Sta. Bul. 110, pp. 447–459*).—A form of rice blight characterized by the appearance of blighted heads at the time the grain is ripening is described.

Various theories have been proposed as to the cause of this trouble. The author has investigated a number of them and has arrived at the conclusion that it is due to some soil condition, probably an organic disturbance, and that whatever it is that causes the disease the plant suffers through injury to the root system.

An investigation of a number of plants from badly infected and slightly infected portions of the field and from a field which contained no blight showed that the roots were injured in proportion to the amount of blight. The blight appears to be associated with decaying plant débris in the soil, and the author proposes this as a working hypothesis to be further investigated.

For preventing the disease, the rotation of crops so as to have rice follow some crop that will leave the land free from decaying débris, plowing late in the fall, the burning of stubble, and such other means as are feasible to complete the normal decay or removal of all straw, weeds, and trash are suggested.

The beet nematode, L. FULMEK (*Monatsh. Landw., 4 (1911), No. 9, pp. 268–275, figs. 8; abs. in Centbl. Bakt. [etc.], 2. Abt., 32 (1912), No. 6–12, p. 314*).—This parasite was studied chiefly in its relation to the sugar beet. Its life history is discussed, also direct and indirect methods of combating its ravages, which also extend to several other cultivated plants. The development period is said to depend largely upon temperature.

Recommendations are made as to economical means for control of the disease, mainly along the following lines: (1) Rotation of crops so that no two which are favorable to the pest shall be planted within 4 years, (2) careful adaptation of fertilizers to soils, (3) shallower plowing, (4) avoidance of carrying infection by feet or tools, (5) removal of harboring weeds, and (6) the Kühn device of trap plants.

Further notes on the sooty mold of tobacco, E. INGLESE (*Bol. Tec. Coltiv. Tabacchi [Scafati], 10 (1911), No. 5, pp. 255–267; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 1, pp. 308.*

309).—In continuation of the author's investigations on the sooty mold of tobacco (E. S. R., 25, p. 455), a study was made of the effect of temperature on the formation of honeydew on the plants. Strong healthy plants about one-third grown were subjected to low and high temperatures by watering with hot and cold water, by placing ice around the plants, by injecting steam under bell jars, etc.

Aside from the temporary disturbance to the nutrition and transpiration of the plants, no injurious effect was noted, and it is concluded that sudden inequalities of temperature have no direct relation to the secretion of honeydew.

Some means for the control of Thielavia on tobacco, AIELLI-DONNARUMMA (*Bol. Tec. Coltiv. Tabacchi [Scafati], 10 (1911), No. 5, pp. 277–281; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 1, pp. 310, 311*).—In experiments in the hybridization of tobacco it has been found that some crosses between the varieties locally known as Kentucky and Italia are quite resistant to attacks of *T. basicola*. One form, called type B, is not only of excellent character as to growth, productivity, and quality, but out of 66 plantations containing more than 320,000 plants, none was attacked by the fungus.

Diseases of cabbage and related crops and their control, L. L. HARTER (*U. S. Dept. Agr., Farmers' Bul. 488, pp. 32, figs. 7*).—Popular descriptions are given of a number of the more important diseases of cabbage and other cruciferous plants, with directions for their control. The diseases described are club root, nematode root knot, black rot, wilt, blackleg, soft rot, malnutrition, downy mildew, white rust, spot disease of cauliflower, leaf blight, powdery mildew and damping off.

Tomato leaf rust (*Bd. Agr. and Fisheries [London], Leaflet 262, 1912, pp. 3, fig. 1*).—A description is given of the leaf rust of tomatoes due to *Cladosporium fulvum*, which, it is said, is becoming a serious pest in parts of Europe. Spraying, if attempted, should be begun early so as to protect the plants, and when the plants are young half-strength Bordeaux mixture may be employed. When the plants are in flower and young fruit present, the use of a solution of potassium sulphid is recommended.

The enzymatic activity of some fruit fungi, D. BRUSCHI (*Atti. R. Accad. Lincei Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 21 (1912), I, Nos. 3, pp. 225–230; 4, pp. 298–304*).—After a brief account of observations made by others in this connection, the author reports his own studies with *Fusarium niveum*, *F. lycopersici*, and *Monilia cinerea*, in substance as follows:

The toxic activity of the 3 fungi studied upon the cells of such fruits as are attacked by them, as the plum, tomato, etc., is not proportional to the acidity of the fungus extract employed, and this toxicity is decreased by heating. None of these 3 fungi produces an enzym capable of attacking cellulose, but *F. niveum* and *M. cinerea* secrete a pectinase which, by dissolving the middle part of the cell wall of fruits, produces rapid maceration. It is doubtful if this ability is shared by *F. lycopersici*. Each of these 3 fungi appears to develop an enzym capable of breaking up nitrogen compounds into proteids and nonproteids.

Gummosis, F. A. WOLF (*Plant World, 15 (1912), No. 3, pp. 60–66*).—The author reviews the various theories that have been advanced to explain the phenomenon of gummosis, which is conspicuous in species of Prunus and Citrus. He claims that until the immediate cause of gummosis is demonstrated, it is reasonable to believe that enzyms play a very important rôle.

Apple tree anthracnose, H. S. JACKSON (*Oregon Sta. Circ. 17, pp. 4*).—The apple tree anthracnose due to *Glœosporium malicorticis* is described. This is one of the most serious fungus diseases of the apple in Oregon. It causes

cankers on the trunk and branches, the infection usually taking place in the fall of the year after the early rains. In addition to the cankers on the tree the fungus is sometimes found upon the fruit.

For the control of the disease the author recommends treatment based on orchard experiments which proved successful in reducing the amount of disease. The treatment consists of spraying with Bordeaux mixture, using a 4:4:50 solution, in the fall before the beginning of the rains, to be followed as soon as the fruit is picked by an additional spraying of a 6:6:50 Bordeaux mixture. It is believed that under ordinary conditions this treatment would be sufficient for controlling the disease, but where the fungus is very prevalent, an additional spraying should be given the trees, beginning somewhat earlier in the season. Where practical the cankers should be cut out before fully formed during the winter or early spring.

The raspberry cane blight and how to control it, P. J. O'Gara (*Off. Path. and Ent. Rogue River Valley, Bul. 4, 1911, pp. 8*).—The author gives a description of the raspberry cane blight caused by *Coniothyrium fuckelii*. This fungus attacks all the cultivated species belonging to the genus Rubus, and has also been observed on the wild species, as well as on roses and apples. The disease shows marked virulence with the black cap varieties of raspberries, and the Cuthbert, which is a red raspberry, suffers to a considerable extent. The varieties Lucretia and Primus of the dewberry are also badly injured.

The parasitism of the fungus has been demonstrated by inoculation experiments. For its control the author recommends the cutting out and removal of all infected canes, which should be burned, and after the field has been thoroughly cleaned, spraying in the fall before the rains begin with a rather strong Bordeaux mixture. An additional spraying should be given in the spring, about 3 applications being made before the blossoms appear. If roses are growing nearby they should also be given attention.

Remedy for court noué (*Rev. Sci. [Paris], 50 (1912), I, No. 14, p. 440*).—In a brief note it is stated that Bertrand has found that the application of either sodium chlorid, or sulphate or phosphate of ammonia, to grapevines at the rate of 150 gm. per liter, following the method adopted for the treatment of chlorosis with iron sulphate, has given good results in combating the court noué, which is characterized by the extreme shortening of the internodes of grapevines. The use of Thomas slag as a fertilizer, applied at the rate of 250 gm. per plant, has also given encouraging results.

Combating leaf spot of grape (Pseudopeziza tracheiphila), A. Bretschneider (*Wiener Landw. Ztg., 61 (1911), No. 5, p. 43; abs. in Centbl. Bakt. [etc.], 2. Abt., 31 (1911), No. 11–15, pp. 402, 403*).—Experiments were instituted by the author in order to test the hypothesis that this fungus lives through the winter in the veins of the fallen leaves, forms spores on these leaves during the winter, and infects the young leaves by means of these in the spring. Removal of the dead leaves seemed to make no difference in the spring infection. The author suggests that the fungus may winter in the vessels of the shoots. The use of sprays (1 per cent Bordeaux mixture, 1 to 2 per cent Cucusa, and 1 to 2 per cent Tenax) seemed to give equally beneficial results whether applied to the upper or the lower surface of the leaves.

The mildew fungi and protection therefrom, O. Broz (*Monatsh. Landw., 4 (1911), No. 3, pp. 71–78, figs. 6; abs. in Centbl. Bakt. [etc.], 2. Abt., 31 (1911), No. 11–15, p. 403*).—This is a somewhat popularized discussion of the so-called true mildew fungi (Erysipheæ) in connection with suggestions for their control, the main reliance being placed on sulphur applied to the green foliage. Bordeaux mixture is recommended as a wash for trees and vines in 2 per cent

strength before leaf fall and 5 per cent in February or March before the young leaves appear.

Experiments on the prevention of olive bacteriosis, G. BELLINI (*Coltivatore, 57 (1911), No. 32, pp. 431–433; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 1, p. 311*).—The author describes the results of experiments carried on in Tuscany on the prevention of the spread of the olive bacteriosis, due to *Bacillus oleæ*.

In April, 1910, a hailstorm severely injured a large olive plantation. The small branches which had been injured by hail were cut from the trees, after which the limbs and trunk of the tree received a strong application of iron sulphate, consisting of iron sulphate 15 kg., lime 15 kg., and water 100 liters. At the same time the trees were sprayed with a dilute Bordeaux mixture composed of 0.8 kg. of copper sulphate, 0.8 kg. lime, and 100 liters of water. The bacterial tumors were cut out wherever observed and the cut surfaces treated with the mixture composed of iron sulphate and lime.

At the close of 1911 no evidence of bacteriosis was to be seen on any of the trees. The growth during the summer had been exceptionally vigorous, and the prospect for a large yield the next year was considered quite promising.

Glœosporiose of the Japanese persimmon, S. ITO (*Bot. Mag. [Tokyo], 25 (1911), No. 296, pp. 197–201, figs. 2; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 1, p. 321*).—In 1910 the author collected and examined a number of specimens of diseased fruit of the Japanese persimmon (*Diospyros kaki*). The present study was undertaken to determine the cause of this disease, which sometimes occasions considerable loss. Badly affected trees are known not to produce fruit for 3 years.

The symptoms of the disease may be recognized by the appearance in the middle or latter part of July of small spots on the unripe fruit. These are black, of varying sizes, from that of a pin head to from 1 to 2.5 cm. in diameter, circular or elliptical in outline, and frequently bordered by a yellowish brown ring. By the coalescence of a number of these spots a considerable area of the fruit may become involved. The affected fruits usually fall to the ground before ripening, and decomposition is hastened by other fungi. The fungus is also capable of attacking fruits in storage.

Inoculation experiments showed that the fungus can be readily transferred to ripe apples when the spores are inoculated on the wounded surface, but the reciprocal infection of the spores of *Glomerella rufomaculans* on green persimmons always gave negative results.

The fungus causing this disease is believed to have been hitherto undescribed, and the name *Glœosporium kaki* n. sp. is given it.

The cause of mottled leaf, R. R. SNOWDEN (*Fla. Grower, 6 (1912), No. 2, pp. 3, 4*).—The author believes that he has traced several cases of malnutrition and incipient chlorosis or mottled leaf in orange and lemon trees to an excessive proportion of magnesia to lime in the soil. Ash analyses of leaves from healthy and sick lemon trees showed that in the leaves from the sick plants the percentage of potash was more than doubled and phosphoric acid increased by 11½ times, while lime was reduced about 50 per cent.

An examination of the soil about thrifty and diseased plants indicated that the magnesia-lime ratio for oranges should not fall below 1 part of magnesia to 2 of lime. For lemons the ratio of 1 : 0.84 was sufficient to maintain good color in the foliage. Below that figure the leaves became mottled or decidedly yellow.

The bud rot of the coconut in Ceylon, N. PATOUILLARD (*Jour. Agr. Trop., 11 (1911), No. 124, pp. 315, 316; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 1, pp. 319, 320*).—The author

quotes from a letter calling attention to the extreme sensitiveness of the coconut palm in Ceylon to injury to its leaves. It is said that the slightest prick or scratch to the tender part of the plant may start the disease. At first a brownish mark appears around the wound, and this gradually spreads until it reaches the center of the bud, where all the young leaves are destroyed.

There seems to be a connection between the appearance of the monsoon and the bud rot. At this time the rains and storms accompanied by the wind not only cause a rapid increase in the sap, but also result in much injury to the leaves, often breaking them off at the base. It is thought that these accidental injuries form one of the principal means of entrance of the organisms which cause the disease.

Attention is directed to the apparent resistance to injury of the coconut palm of the West Indies, where the leaves are often cut without evidence of the occurrence of the disease.

A new disease of lily of the valley, J. Politis (*Riv. Patol. Veg., 5 (1911), No. 10, pp. 145–147; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 2, p. 566*).—The author describes a disease of *Convallaria majalis* in the botanic gardens of Pavia, the plants being attacked by *Botrytis vulgaris*. The fungus caused much injury to the vegetative parts of the plant and reduced the number of flowers to a considerable extent. Inoculation experiments demonstrated the parasitism of the fungus, as has been shown by other investigators.

Loranthus sphærocarpus parasitic on Dracæna, F. Arens (*Centbl. Bakt. [etc.], 2. Abt., 32 (1912), No. 20–25, pp. 564–587, pl. 1, figs. 6*).—This is a detailed study of host and parasite in their anatomical and physiological relations.

The mycoplasm theory, J. Eriksson (*Biol. Centbl., 30 (1910), No. 1, pp. 618–623*).—This is a brief account of previous studies on the subject by the author and some others (E. S. R., 26, p. 846).

Notes on some western Uredineæ which attack forest trees, G. G. Hedgcock (*Mycologia, 4 (1912), No. 8, pp. 141–147; abs. in Phytopathology, 2 (1912), No. 1, p. 47*).—An account is given of a number of species of Peridermium which attack conifers, especially in the Western United States. Among them are *P. filamentosum*, *P. pseudo-balsameum*, *P. harknessii*, and *P. montanum*. In addition descriptions are given of *Uredo* (*Melampsora*) *bigelowii*, the æcidial form of which occurs on larches, the other stages being very prevalent on willows in the West and Southwest. The presence of *U.* (*M.*) *medusæ*, a fungus common on poplar, is also noted.

The chestnut bark disease, N. J. Giddings (*West Virginia Sta. Bul. 137, pp. 209–225, figs. 12*).—The blight or bark disease of chestnut due to *Diaporthe parasitica* is described. The history of the disease, description of its attack on chestnut trees, and its distribution throughout the United States are indicated, together with such measures as have been adopted by the U. S. Department of Agriculture and the Pennsylvania Chestnut Tree Blight Commission for its control. The author states that the disease has been reported from 3 rather widely separated localities in West Virginia, and recommendations are made to prevent its establishment and spread.

The progress of the fight against the chestnut blight (*Forest Leaves, 13 (1911), No. 6, pp. 88, 89, figs. 6*).—An account is given of the work of the Pennsylvania Chestnut Tree Blight Commission during 1911 in locating the spread of the chestnut blight in the State. The commission is carrying on laboratory work, determining the life history of the fungus. It is stated that the only practical method of destroying the spores is felling the trees and burning the bark and brush. As part of the State is badly infected, the commission is recommending the cutting and utilization of the timber as rapidly as possible.

The wintering and combating of the oak mildew, F. W. NEGER (*Tharand. Forstl. Jahrb., 62 (1911), No. 1, pp. 1–9, figs. 3*).—Investigations are reported which indicate that the conidia of the oak mildew do not withstand the winter, but that the fungus is carried over by means of mycelium in the buds. For the control of the mildew in nurseries and elsewhere 1 or 2 sprayings with lime-sulphur are recommended, the number of applications to be determined by the virulence of the attack.

Preliminary notes on three rots of Juniper, G. G. HEDGCOCK and W. H. LONG (*Mycologia, 4 (1912), No. 3, pp. 109–114, pls. 2; abs. in Phytopathology, 2 (1912), No. 1, p. 48*).—The authors give descriptions of the gross and microchemical characters of 3 heart rots of junipers, also the distribution and damage done by each, and technical descriptions of the sporophores. The rots discussed are the white rot of *Juniperus virginiana*, due to *Fomes juniperinus;* yellow rot of *J. monosperma*, *J. utahensis*, and *J. sabinoides*, caused by *F. carlei;* and the stringy brown rot of *J. sabinoides*, *J. monosperma*, and *J. utahensis*, caused by *F. texanus*.

The nature of witches' brooms on Pinus sylvestris, F. ZACH and K. VON TUBEUF (*Naturw. Ztschr. Forst u. Landw., 10 (1912), No. 1, pp. 61–64, fig. 1*).—A discussion is given on the nature and causes of witches' brooms occurring on the above and other species of pine.

The blister rust of white pine, A. D. SELBY (*Ohio Nat., 11 (1911), No. 4, pp. 285, 286; abs. in Centbl. Bakt. [etc.], 2. Abt., 32 (1912), No. 6–12, p. 333*).—This disease, known to have been found recently in two or three places in the United States, is thought by the author to have come from Germany with seedlings bought there. The blister rust has long been notable in that country on account of its preference for American white pine. The fungus (*Peridermium strobi*) is stated to be one stage of the rust of currants and gooseberries (*Cronartium ribicola*).

A disease of eucalyptus, R. AVERNA-SACCÁ (*Bol. Agr. [São Paulo], 12. ser., 1911, No. 7, pp. 474–482, fig. 1*).—The author describes a disease of eucalyptus due to some species of Erysiphaceæ, and gives briefly the results of experiments for its control. The disease is most prevalent upon seedlings in the nursery, and spraying with potassium sulphate solution or the use of sulphur is recommended. In case of the presence of another disease, which is thought to be due to Peronospora, the addition of 3 per cent powdered copper sulphate to the sulphur is advised.

A new paint-destroying fungus, G. MASSEE (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., 1911, No. 8, pp. 325, 326, pl. 1*).—The author describes a fungus that flourishes in great profusion on fresh paint in hothouses, its development being favored by a high temperature and constant humidity. It has also been observed occurring on paint elsewhere.

About a month or two after a hothouse has been painted, numerous small pale rose-colored specks appear. These increase in size and change to a purple or sometimes dark red color. Where white paint has been used the coloring is very conspicuous. When the fungus appears in abundance the paint is ruined, in one instance a loss of more than $1,000 in a number of greenhouses being reported.

The presence of 2 per cent carbolic acid in paint was found to arrest the development of the fungus, and hydrogen peroxid would bleach or considerably reduce the red color without injuring the paint.

The fungus, which is believed to be undescribed, is named *Phoma pigmentivora* n. sp., and a technical description is given.

Experiments with lime sulphur against some fungus diseases, L. SAVASTANO (*R. Staz. Sper. Agrum. e Frutticol. Acireale, Bol. 5, 1912, pp. 6*).—Ex-

periments are reported in which lime-sulphur solutions were used to control the sooty mold on olives and oranges and the mildews of grapes, peaches, roses, oaks, etc.

The results show that lime-sulphur is efficient in controlling powdery mildews, exceeding in that respect sulphur as ordinarily applied. For the sooty mold the results were less definite, although the solution had value as an insecticide against the scale insects. For the rose rust it was inefficient.

Notes on the preparation of copper fungicides, G. CHAPPAZ (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 33 (1912), No. 12, pp. 353–360, figs. 3*).—Directions are given for the preparation of various fungicides, and particular attention is paid to what are believed to be some of the essential facts relative to securing the most beneficial mixtures. The fungicides described are Bordeaux mixture, Burgundy mixture, Bordeaux mixture modified by the addition of neutral copper acetate, and fungicides containing soap, resin, oil, etc.

The influence of tobacco smoke on plants, H. MOLISCH (*Anzeiger K. Akad. Wiss. Wien, Math. Naturw. Kl., 1911, No. 2, pp. 20–22; abs. in Centbl. Bakt. [etc.], 2. Abt., 31 (1911), No. 11–15, pp. 380, 381*).—This is substantially a summary of reports already noted elsewhere (E. S. R., 26, p. 230).

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Further notes on the fruit-eating habits of the sage thrasher in the Yakima Valley, Washington, C. H. KENNEDY (*Auk, 29 (1912), No. 2, pp. 224–226*).—In these further notes (E. S. R., 25, p. 150), the author states that the sage thrasher (*Oreoscoptes montanus*) did not appear in 1911 in numbers until the middle of August, thus was too late to attack blackberries and raspberries.

It was found that the omission of summer pruning to remove the extra foliage effectually protected nearly all of the bunches of Campbell Early grapes, the earliest variety to ripen, and concentrated the damage on the few that were exposed. It failed, however, to save the Tokays and other *Vitis vinifera* varieties, which began ripening 3 weeks after Campbell Early. In order to save the later varieties shooting was resorted to. "The small number killed and the speedy and complete disappearance of the species seemed to indicate that they are very local in their individual ranges, and that these were living altogether in the vineyard during their depredations."

The results of examinations made of 12 stomachs are reported.

"The omission of summer pruning is not a satisfactory method of saving the Campbell Early grapes as the later ripening involves a loss of about 30 per cent in value." The sage thrasher must be killed, and it is thought to be justifiable to shoot early enough to save the Campbell Early.

The English sparrow as a pest, N. DEARBORN (*U. S. Dept. Agr., Farmers' Bul. 493, pp. 24, figs. 17*).—This bulletin, designed to supersede Farmers' Bulletin 383 (E. S. R., 22, p. 549), describes means for aiding native birds against the English sparrow, the prevention of increase, and the best methods of effecting a reduction of their number. Additional directions for trapping and illustrated plans for the construction of traps are included.

Starling (Sturnus vulgaris) in Chester County, Pa., T. H. JACKSON (*Auk, 29 (1912), No. 2, pp. 243, 244*).—A flock of 30 or more individuals is reported to have been observed in December near West Chester.

State of Washington laws relating to fish, oysters, and game. 1911 (*Olympia, Wash.: State Fish and Game Dept., 1911, pp. 116*).—The laws relating to fish, oysters, and game are compiled and indexed in this handy form.

Methods in insect photography, W. C. O'KANE (*Jour. Econ. Ent., 5 (1912), No. 1, pp. 54–59, pl. 1*).—This paper considers cameras and lenses, methods of lighting, posing the object, plates and developer, preparation for printing, and prints for half-tones.

Some recent new importations, C. L. MARLATT (*Jour. Econ. Ent., 5 (1912), No. 1, pp. 73–77*).—Among the pests reported to have recently been introduced into the District of Columbia are the spruce aphid (*Lachnus juniperi*) on young spruce trees from Holland; a peach seed weevil (*Anthonomus druparium*), which is already a very serious pest in Europe from Siberia; a cecidomyiid, related to the Hessian fly, on lotus introduced as a fodder plant; the mango seed weevil (*Cryptorhynchus mangiferæ*); etc. The recently established pests mentioned include the European red tail (*Dasychiria pudibunda*) in New Jersey; the European smaller elm bark beetle (*Scolytus multistriatus*) in Massachusetts; the apple seed chalcis (*Syntomaspis druparum*) in New York; *Pulvinaria psidii*, *Aleyrodes howardii*, and the oriental scale pest (*Conchaspis angræci*), in Florida, etc.

It is stated that the investigations conducted by the Bureau of Entomology in Pennsylvania last year have demonstrated that the apple seed chalcis has spread in destructive numbers into orchards in that State. In some orchards at least one-third of the crop was destroyed by it.

The insect enemies of trees and herbaceous plants in Uruguay, A. BOUYAT (*Rev. Asoc. Rural Uruguay, 40 (1911), No. 9, pp. 707–718, figs. 5; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 11–12, p. 2612*).—The more important insects are here considered, including their life history, damage caused, methods of treatment, enemies, etc.

Some apple insects of Connecticut, G. H. LAMSON (*Connecticut Storrs Sta. Bul. 71, pp. 41–83, figs. 33*).—A general account of insects and methods of control is followed by a brief popular account of the more common insect enemies of the apple with directions for combating them.

What is the matter with the elms in Illinois? S. A. FORBES (*Illinois Sta. Bul. 154, pp. 3–22, figs. 10*).—This bulletin calls attention to a fatal affection of the American white elm, "now prevailing over a large part of southern Illinois, similar to and apparently identical with one which destroyed many elms in the central part of the State some 30 years ago. The character, extent, and cause of this destruction are such as to make it plain either that the elm must receive much more intelligent and assiduous care and treatment than it has heretofore had in this State, or that it must yield its place to some tree more hardy under conditions which it has itself failed to support.

"The elm disease (if such it may be called) now prevalent is first noticed from early summer to autumn—the leaves, first on the terminal twigs and later on the larger branches, ceasing their growth, turning brown, and finally falling. This loss is presently followed by the death of the branches themselves, as is shown the following spring when the rest of the tree leaves out. Usually the higher branches are first affected, but the whole top soon seems to blight, and in a year or two the tree is dead. Sometimes this process is greatly shortened, and scores of trees may perish within a single year after the first effects are noticed; and sometimes, on the other hand, it is greatly lengthened, extending through 5 or 6 years, and, in mild cases, even ending in recovery.

"Although there may be no definite sign of insect injury anywhere, it is most commonly the case that a thorough search of the trunk and larger branches will show patches of dead bark under which there are 2 or more kinds of burrowing insect larvæ, or borers. The roots of these trees are often affected somewhat as the branches are; that is, the smaller, terminal, so-called feeding roots

die and dry up progressively, the process extending to the larger roots and the base of the trunk." It is stated that the trees are not affected when growing under natural woodland conditions.

The author concludes that the injury is caused in part by drought and unnatural conditions of the tree, resulting in starvation, and in part by borers in the trunk, attracted by the unthrifty state. The former is perhaps the primary trouble in most cases. He considers free watering, fertilizing, and mulching of the soil to be necessary, at least in severe drought. Care should be taken in trimming trees and painting cut surfaces to prevent infestation; the use of various mixtures as repellents to borers is also suggested.

Brief descriptions are given, together with illustrations and the life histories, of the elm borer (*saperda tridentata*) and the reddish elm snout beetle (*Magdalis armicollis*), the insects chiefly concerned.

The cotton stainer (Dysdercus suturellus), W. D. HUNTER (*U. S. Dept. Agr., Bur. Ent. Circ. 149, pp. 5, figs. 2*).—*D. suturellus*, the only representative of the genus which occurs in the United States, is not of very great importance on account of its local restriction, but in Florida it is undoubtedly the most important cotton insect at the present time. Although it has a number of food plants, the only ones of special importance aside from cotton are the orange and the eggplant. Among the wild plants upon which this insect feeds are *Hibiscus* sp., as well as several others including guava, Spanish cocklebur (*Urena lobata*), and nightshade (*Solanum nigrum*).

The feasible means of control of this insect, in the order of their importance, are as follows: "(1) The prevention of the growth of the weeds upon which the cotton stainer breeds in great numbers; (2) the destruction, by means of kerosene and water, of the colonies of young bugs as soon as they make their appearance during the growing season; and (3) the attracting of the insects to small piles of cotton seed and their destruction when congregated in large numbers by means of hot water or kerosene."

Observations on the life history of Enchenopa binotata, I. MATAUSCH (*Jour. N. Y. Ent. Soc., 20 (1912), No. 1, pp. 58–67, pls. 2*).—This is an account of the eggs, larvæ, and nymphal forms of the membracid *E. binotata*.

Papers on Aphididæ.—Studies on a new species of Toxoptera, with an analytical key to the genus and notes on rearing methods, W. J. PHILLIPS and J. J. DAVIS (*U. S. Dept. Agr., Bur. Ent. Bul. 25, pt. 1, tech. ser., pp. 16, pl. 1, figs. 9*).—*Toxoptera muhlenbergiæ*, here described as new, first came under the authors' attention on July 24, 1908, at which time it was collected at New Paris, Ohio, on a species of Muhlenbergia. Later in the month it was found at Richmond, Ind. The species is closely related to the so-called green bug, having at first been mistaken for *T. graminum*.

Technical descriptions of its stages are presented. It has been found throughout northwestern and west-central Ohio and through east-central and northern Indiana, and probably occurs in any location in which Muhlenbergia flourishes. "Individuals of this species concentrate on the tender shoots and are rarely found on the tough leaves unless the plants are badly infested. They congregate in the curled central growing shoot. As this leaf expands and unfolds, they go to the younger curled leaf just below this. When in great numbers, they cause these tender shoots to wilt and turn yellow. Up to the present time *Muhlenbergia* sp. appears to be the normal host, though this aphis often goes to blue grass (*Poa pratensis*) when first hatched, since the young sometimes appear before Muhlenbergia has started growth. Colonies have been established on wheat, though they do not appear to thrive very well on it."

Approximately 10½ generations per year are indicated by the investigations here reported. "The period between birth and reproduction varies greatly,

being longest in the spring, when it varies from 15 to 22 days. In summer the shortest period was 6 days, varying from 6 to 13 days. In the fall it varies from 9 to 13 days. The average period throughout the season for the 13 individuals of the series of first born is 13.1 days.

"The length of life, like the period between birth and reproduction, varies greatly. During the spring, when lower temperatures prevail, the viviparous forms will live from 30 to 63 days, while in the summer they live from 16 to 29 days, and in the fall over 30 days. The average length of life throughout the season for the 13 viviparous individuals of the series of first born is 28.9 days.

"The sexes make their appearance about the first week in October. . . . A viviparous female may produce oviparous and viviparous females and males or she may produce only the sexes. Males and females reach maturity in from 15 to 23 days. The female will not oviposit without having first been fertilized and will live, under these conditions, for about a month, her abdomen becoming greatly distended with eggs. . . . When ready to oviposit, the females crawl down into the leaf sheath, which is usually separated from the plant stem for a part of its length and is somewhat curled, and deposit their eggs in this curled portion. The senior author has counted as many as 200 eggs in such a position."

A description of rearing methods followed is appended.

The life history of the alder blight aphis, T. Pergande (*U. S. Dept. Agr., Bur. Ent. Bul. 24, tech. ser., pp. 28, figs. 12*).—The author's long-continued observations of *Pemphigus acerifolii* Riley, inhabiting the soft or silver maple (*Acer dasycarpum*), and of *P. tessellata* Fitch, inhabiting the alders, have resulted in furnishing conclusive proof that these are "merely forms or series of one and the same species, which should now be known as *Prociphilus tessellata* (Fitch)."

"*P. acerifolii* issues during the early or middle part of April, or as soon as the young leaves appear, from winter eggs deposited the previous fall in cracks or under loose bark on the trunks of maples, on which return migrants from alders had delivered themselves of the true sexes. These young stem-mothers, after hatching from winter eggs, travel upward onto the branches and settle on the midrib of the underside of the young leaflets. Usually there is but 1, though frequently there may be 2, 3, or more on the same leaf, in consequence of which, as well as from the increasing irritation, the leaves thus infested exhibit a more or less marked tendency to fold or almost to 'double up' from the midrib downward.

"Under or within this protection or covering there may be observed numbers of larvæ and pupæ of different stages, up to 100 or more, in company with their mother, all of which, from early in June to the end of July, or until the supply of migrants has been exhausted, develop into winged migrants, without, however, leaving any larvæ behind to continue the series on the maple. These migrants fly then to the alders, which frequently are rather distant from the maples, and settle at once on the underside of the leaves of these shrubs, where they are soon engaged in depositing their larvæ, which surround them in a circle of about 20 to 100. These larvæ, after feeding for about an hour or so, move to the twigs, branches, or stems of the shrubs to start a new cycle of life for the species. Here a number of generations is developed, after which, from about the middle of September to the middle of October, numerous return migrants are developed, which fly back to the trunks of the maples to continue the cycle of life prescribed by nature."

The original host plant of this species is, therefore, the silver maple and not the alder, which is a secondary food plant. The most active among the carnivorous enemies are the larvæ of the lycænid butterfly *Feniseca tarquinius*, the larvæ of the lace wing fly *Chrysopa sicheli*, the larvæ and imagos of 2 lady

beetles, *Hippodamia convergens* and *Adalia bipunctata*, the larvæ and imagos of an hemipteron (*Nabis*) *Pagasa fusca*, and the larvæ of various syrphid flies, which generally prove very destructive to these aphids and frequently exterminate whole colonies. As yet no internal parasites of this species are known. The ants which have been observed to construct tunnels or covers over these aphids are *Tapinoma sessile* and *Cremastogaster lincolata;* among those which simply gather honeydew are *Camponotus pennsylvanicus*, *Lasius alienus*, and *Monomorium minimum.*

Technical descriptions are given of the principal stages.

Flour mill fumigation, W. H. GOODWIN (*Ohio Sta. Bul. 234, pp. 171–184, fig. 1*).—This bulletin deals with the control of the Mediterranean flour moth, which appeared in Ohio in 1895 and has since spread through the medium of secondhand machinery, and more often secondhand sacks, to many of the flour mills of the State.

It is stated that by the constant watching of spouts, machines, conveyors, and bolters, together with a thorough cleaning of the whole mill once or twice a year, the pests may be almost kept in control. Detailed directions are given for the fumigation of mills with hydrocyanic acid gas, together with an account of the fumigation of 3 mills by the author.

The generation of heat by steam radiators in a mill in which maximum temperatures were reached, 141° F. on the first floor, 138° on the second floor, and 142° on the third floor and deck, indicate that heat can be used successfully for protecting flour mills and stored products against insects. All stages of the following named mill pests are stated to have been killed, even by the temperature attained on the lower floor: Rice weevil, granary weevil, saw-toothed grain beetle (*Silvanus surinamensis*), yellow mealworm, dark mealworm (*Tenebrio obscurus*), cadelle, confused flour beetle (*Tribolium confusum*), *Platydema* sp., and Mediterranean flour moth.

The advantages favoring the use of high temperature are summarized as follows: "It is not dangerous to human life as are all of the other fumigants which are even fairly effective. There is no possibility of injuring floors, belts, or machines, and practically no danger from fire. The cost of a treatment, after the heating system is installed, is less than one-fiftieth of that of hydrocyanic acid gas fumigation. No time is lost in getting ready to use heat. The mill does not need to be shut down a week beforehand, and as most of the Ohio flour mills use steam power, the cost of a heating system would not be prohibitive. High temperature, as compared with other methods of treatment, by saving time and extra expense, will pay for the average heating system required in a flour mill in less than 5 years."

Larvæ of a saturniid moth used as food by California Indians, J. M. ALDRICH (*Jour. N. Y. Ent. Soc., 20 (1912), No. 1, pp. 28–31, pl. 1*).—Saturniid caterpillars, apparently of the genus Hemileuca, are said to be collected by the Indians of the Mono Lake region from the leaves of the yellow pine (*Pinus ponderosa*). A smudge fire made beneath the tree causes them to drop and they are then killed and dried. The collection of this caterpillar for food appears to be an industry of considerable importance in the territory along the Nevada-California line.

Some observations on the relations of ants and lycænid caterpillars, and a description of the relational organs of the latter, E. J. NEWCOMER (*Jour. N. Y. Ent. Soc., 20 (1912), No. 1, pp. 31–36, pls. 2*).—The author, who has made observations on the behavior of ants toward the larvæ of *Lycæna fulla* and *L. pseudargiolus piasus*, finds the larvæ of the latter species very generally attended in the third and fourth instars by the ants *Tapinoma sessile* and *Prenolepis imparis*, and occasionally by Cremastogaster and Camponotus (?).

This attention is due to the excretion by the larva, from a slit on the tenth body segment, of a liquid agreeable to the ants.

Third report of director of fruit fly control, W. M. GIFFARD (*Hawaii. Forester and Agr., 9 (1912), No. 2, pp. 46–48*).—It is stated that since the last report (E. S. R., 26, p. 758) the entomological department has succeeded in breeding the Mediterranean fruit fly from the fruit of carambola and brown persimmon. "In the latter case a single fruit was handed us, it having been the only one maturing on a newly introduced species." The author states that this fly has been bred from Chinese oranges, received from the Kohala district in the island of Hawaii.

On the rearing of a Dermatobia hominis, A. BUSCK (*Proc. Ent. Soc. Wash., 14 (1912), No. 1, pp. 9–13*).—An account of the actual breeding of this oestrid parasite from man.

The infestation took place at Cabima, Panama, on May 29; only 1 cast skin was observed during the larval period; this was shed and pushed out nearly entire through the aperture in the skin on July 19; on September 9 the larva had attained full growth and left the arm, posterior end first. On being placed in a jar with wet sand it immediately burrowed down 2 in. to the bottom of the jar and pupated. The fly issued on October 23. The author states that a much greater period of sleep was necessary during infestation.

The horse botflies in Argentina, F. LAHILLE (*Bol. Min. Agr. [Buenos Aires], 13 (1911), No. 12, pp. 836–856, pl. 1, figs. 8; Rev. Asoc. Rural Uruguay, 41 (1912), No. 2, pp. 136–145*).—An account of the life history, habits, and occurrence of *Gastrophilus nasalis*, the effect of its presence upon the host, prophylactic measures, etc., with notes on several other species.

The genera Hypera and Phytonomus (Coleoptera, Family Curculionidæ) in America, north of Mexico, E. G. TITUS (*Ann. Ent. Soc. Amer., 4 (1911), No. 4, pp. 383–473, pls. 10, figs. 12*).—One species of Hypera (*H. punctata*) and 12 of Phytonomus, namely, *P. eximius*, *P. quadricollis*, *P. comptus*, *P. diversipunctatus*, *P. seriatus*, *P. trivittatus*, *P. maritimus*, *P. castor*, *P. pubicollis*, *P. meles*, *P. nigrirostris*, and *P. posticus* are recognized. Under each species the author gives a complete synonymic bibliography, original description, new descriptions of the stages so far as known, distribution, food plants, and life history. Maps illustrating the distribution are included.

A revision of the genus Lasconotus, E. J. KRAUS (*Proc. Ent. Soc. Wash., 14 (1912), No. 1, pp. 25–44*).—The author recognizes 24 species as belonging to this genus of the coleopterous family Colydiidæ, 9 of which are described as new to science.

"Very little is known concerning the exact habits of the species. They are usually found associated with various scolytids inhabiting coniferous trees. Principal among these are Pityophthorus (Tomicus), and at least 2 species are found with Phlœosinus. Whether they are commensals or predaceous is not well known. The mouthparts, so far as I have examined, would indicate a predaceous habit, but even if so, whether they prey upon the scolytids themselves or the numerous other insects found in their galleries is still an open question. The larva is also so far unknown."

The sugar cane beetle in Mauritius (*Agr. News [Barbados], 11 (1912), No. 258, p. 90*).—It is stated that the beetle, which has recently become a serious enemy of sugar cane in Mauritius,[a] has been identified as *Phytalus smithi*. The fact that this species occurs in the Barbados, but is not of economic importance, is thought to be due to some very effective natural enemy.

Papers on cereal and forage insects.—The false wireworms of the Pacific Northwest, J. A. HYSLOP (*U. S. Dept. Agr., Bur. Ent. Bul. 95, pt. 5, pp. 73–87,*

[a] Bul. Agr. [Mauritius], 2 (1911), No. 19, pp. 475, 476.

figs. 6).—Up to within the past 5 years, except for a few scattering notices, the species of Eleodes, the larvæ of which are known as false wireworms, have been considered of only incidental if of any economic importance. Superficially the larvæ resemble the elaterid, or true wireworms, and on account of their resemblance and the similarity of their depredations in grain fields the two are often confused. On close examination, however, Eleodes larvæ are readily recognized by their structure.

Reports of their injury have been received or published from Nebraska, Kansas, and Washington. The results of 3 seasons' work in the Pacific Northwest are said to demonstrate quite conclusively that the false wireworms are among the most destructive insects to recently planted wheat and corn in that region, ranking second only to the true wireworms in importance.

The genus Eleodes is very closely confined to the Upper and Lower Sonoran Zones. The beetles do not fly and are therefore comparatively restricted in their distribution. The mass of the species occur in the Southwest, while several occur in the arid and semiarid regions of California, Oregon, Washington, and Idaho. A few species extend into the Carolinian Zone in Kansas, Nebraska, and Iowa, *Eleodes tricostata* having been collected as far east as Independence, Iowa.

Investigations conducted in the Big Bend region of Washington, briefly reported, are followed by technical descriptions of the egg, larva, pupa, and adult of *E. letcheri vandykei* and *E. pimelioides*. "False wireworms are known to feed on the seed of wheat, oats, and corn, on the tubers of potato, on the fleshy roots of sugar beet, and on several garden crops, as well as on a variety of dead organic matter. . . . The adult beetles have been observed feeding on the seed of wheat and corn, on the leaves of corn, on *Polygonum littorale* and other weed leaves, and on decaying vegetable matter."

The adults of *E. letcheri vandykei*, which emerge from hibernation in the early spring, soon deposit their eggs a few at a time in the ground, the female burrowing down through the soft dust to the moist soil below, usually to a depth of from 2 to 4 in. The average number of eggs laid appears to be about 150. The eggs hatch in about 18 days and the larvæ feed throughout the summer, usually on decaying vegetable matter, hibernate, and resume feeding as soon as the soil becomes warm enough the following spring. At this time they seriously injure spring sown grain. In June they transform to pupæ and early in July the newly emerged adults commence to appear. These adults feed during the remainder of the summer, congregating in large numbers under grain sacks, shocks, and any convenient shelter. They eat a small amount of grain and other vegetable matter and go into hibernation without mating and in the spring resume their activity. While the adults of the species here treated seem normally to live but 1 season, Blaisdell records keeping adults of *E. dentipes* in confinement for over 4 years.

Mention is made of a number of birds, horned toads or lizards (*Phrynosoma* sp.), and the garden toad (*Bufo* sp.), which have been found to feed upon the pest. A microgasterid parasite (*Perilitus* n. sp.) is said to have been reared from an adult *E. suturalis*, received from Belvidere, Nebr. A disease of the larva has also been reported from Nebraska.

The author recommends a modification of the farm practice as now followed. "Disk as early as the land can be worked and the apparatus is available, which will usually be in April. This will conserve the moisture fully as well as plowing. Then plow as late as possible; if the land has been well disked and the men and horses can be spared, it is well to defer this plowing to late July and early August. At this time the beetles are in the pupal, or, as they are commonly called, 'white-worm,' stage. They can not move through the ground as can the

active larvæ, but can merely squirm when irritated. The plowing, which should be deep to be effective, turns out great numbers of these pupæ, and they are either eaten by birds or killed by the burning sun. Many more are destroyed by being crushed or suffocated in the broken pupal cells. Aside from killing many Eleodes pupæ, this practice of late plowing the summer-fallow would greatly aid in weed eradication."

The results obtained through treating the seed with lead arsenate at the rate of $\frac{2}{3}$ lb. per bushel, dissolved in water; strychnin sulphate, at the rate of $\frac{2}{3}$ oz. per bushel, dissolved in water; and coal tar applied until the seed was all coated, then sanded until dry, were entirely negative, as all the plats, including the checks, were about equally attacked.

Technical results from the gipsy moth parasite laboratory.—IV. The chalcidoid genus Perilampus and its relations to the problem of parasite introduction, H. S. Smith (*U. S. Dept. Agr., Bur. Ent. Bul. 19, pt. 4, tech. ser., pp. 33–69, figs. 8*).—During investigations in the spring of 1909 the author found a first stage larva (for which type of larva Wheeler has suggested the term "planidium") of *Perilampus hyalinus*, in the larvæ of *Limnerium validum*, an important parasite of the fall webworm. Later an adult was reared from a second planidium encountered in a pupa of the tachinid *Varichæta aldrichi*, also an important enemy of the fall webworm.

During the following fall several thousand young fall webworm caterpillars were collected and reared to maturity. *Apanteles hyphantriæ* Riley was found to be a fairly common parasite of the younger caterpillars, and *V. aldrichi* and *L. validum* of the older ones, as during the preceding summer. Examination of the puparia and cocoons of the parasites disclosed the fact that the planidia of Perilampus were even more common than they were during the preceding year. Maggots of the tachinid which had emerged from the caterpillar were examined and found to contain the planidia internally. "Dissection of the fully developed caterpillars revealed the fact that the tachinid maggots while still within the caterpillar contained these planidia, and going back still further to the younger caterpillars, the planidia were found to be present here irrespective of whether the caterpillar was infested by a primary parasite or not. Examination of a considerable number of the Hyphantria caterpillars showed that the planidium could be found in almost any portion of the caterpillar's anatomy, although they generally 'floated about' freely in the body cavity. Occasionally specimens attached to the larval organs, such as the alimentary canal or silk glands, were encountered. Further study of still younger caterpillars revealed the most interesting and significant feature of the whole life cycle, namely, the presence of the planidia upon the exterior of the caterpillars. These were apparently about to make their way through the integument to the interior in a search for suitable hosts upon which to complete their development."

Just how these planidia came to be located upon the skin of the caterpillars and how, when, and where the adult female Perilampus places her eggs, could not be ascertained. It is suggested that either the eggs are deposited upon flower heads or upon leaves of plants not in the immediate vicinity of the caterpillar colony, the planidia hatching from these eggs and being conveyed to the caterpillars by means of some intermediate carrier, or, which seems to be more plausible, that the eggs are deposited upon the food plant in the vicinity of a colony of the caterpillars. Dissection of adult female Perilampus indicated that the eggs are very numerous, as high as 250 fully developed eggs being found at one time.

Once the planidium becomes affixed to the caterpillar, it makes its way through the thinner portion of the integument found at the junctures of the segments, this passage being effected by means of its well-developed mouth

parts and specially armored head. From the data at hand it seems most likely that the time of attack upon the host larva follows at once upon the finding of another parasite within the caterpillar.

"Just what is the effect upon the caterpillar itself which is infested by Perilampus but which contains no primary parasite is a matter for conjecture. It seems likely, however, that its presence would not prevent the caterpillar from reaching its full development and it is probably only slightly inconvenienced if affected at all. . . .

"In case the planidium chooses a maggot of Varichæta as its host, it remains endoparasitic until the puparium is formed. During the process of histolysis the Perilampus either orients itself in such a manner that it will be external to the tachinid pupa when pupation is completed, or it emerges from the pupa immediately after pupation; in either case, of course, it remains within the puparium. When parasitic upon this host the planidium, so far at least as the writer has been able to learn, normally hibernates in this stage and probably without nourishment."

In the case of the ophionine parasite *L. validum*, which emerges from the older caterpillars in the fall and hibernates as a larva in a silken cocoon, *P. hyalinus* appears always to remain endoparasitic throughout the winter. Dissections of hundreds of the puparia and cocoons brought to light the fact that whether the winter was passed ectoparasitically as upon tachinids, or endoparasitically, as upon *L. validum*, is dependent entirely upon the life cycle of the host parasite, that is to say, the planidium lives internally in its host until histolysis takes place, when it changes its mode of life from an internal parasite to an external parasite.

The other primary parasites of the fall webworm from which the author has reared Perilampus are 2 additional species of Limnerium, differing from *L. validum* in that they spin their cocoons within the skin of the caterpillar and emerge in the fall, and the braconids *A. hyphantriæ* and a Meteorus, probably *M. communis*. In all 4 of these species the Perilampus completes its development at once. As yet the author has not actually found Perilampus to be a parasite of the large solitary ichneumonids *Anomalon ambiguum*, *Ichneumon cinctitarsis*, and *Melanichneumon* sp.

On the return of warm weather in the spring growth takes place gradually, following the completion of which, after a short resting period, ecdysis takes place. After settling down the second time the larva is likely to remain stationary for the rest of the larval (and the pupal) life pupation taking place as soon as it is full fed.

Discussions of the food habits of the adult, longevity and oögenesis, length of life cycle and influence of temperature, effect of parasitism upon the host, percentage of parasitism, superparasitism, description of a second species of Perilampus met with, the development of *Orasema viridis*, parasitic principally upon the harvesting ant *Pheidole instabilis*, as described by Wheeler (E. S. R., 20, p. 254), relationship of Eucharidæ and Perilampidæ, Rhipiphorus and other coleopterous parasites, host relations of the genus Perilampus, including a review of European rearing records of Perilampus, etc., and the economic aspects, follow.

An internal parasite of Thysanoptera, H. M. Russell (*U. S. Dept. Agr., Bur. Ent. Bul. 23, pt. 2, tech. ser., pp. 25–52, figs. 11*).—This is a detailed report of studies made of the life history, habits, and economy of the parasite *Thripoctenus russelli*, a summarized account of which has been previously noted (E. S. R., 26, p. 858).

On a new enemy of the grapevine cochylis, F. Picard (*Bul. Soc. Ent. France, 1911, No. 12, pp. 260, 261; Prog. Agr. et Vit. (Ed. l'Est-Centre), 32*

(1911), No. 52, pp. 773–775).—The author reports having found *Odynerus chevrieranus* to be an enemy of *Cochylis ambiguella* at Castries, in the Department of Hérault.

Two destructive Texas ants, W. D. Hunter (*U. S. Dept. Agr., Bur. Ent. Circ. 148, pp. 7*).—The cutting or parasol ant (*Atta texana*) is known only from a limited area in south-central Texas, which extends from the Brazos River as far north as Waco to the Gulf, westward as far as San Antonio, and southward to the vicinity of Alice. "The ant is most common in the valleys of the Colorado, Guadalupe, Comal, and San Antonio rivers. In these situations it is evidently increasing in numbers from year to year. In many cases the nests occupy the land practically continuously for many miles up and down the valleys. . . .

"The habits of this insect have attracted great attention from scientists and others. The ants cut the leaves from trees and carry them to the nests. Each leaf is finely divided and made into small pellets. In this work the mandibles and legs of the ants are utilized. The small masses are placed upon the so-called fungus garden, where they furnish a growing medium for the growth of a fungus which furnishes the colony with food. As the supply of fungus is consumed the ants add to the old mass, so that eventually the nests are found to contain large spongy formations on the outer portion of which the slender threads of the fungus are growing. Evidently the ants exercise great care in preventing the contamination of the fungus garden by any but the sole species of fungus that is utilized. . . .

"The distance over which foraging expeditions take place may be 200 yds. or even more. Practically all species of plants seem to be suitable for food, although it is noticeable that only 1 species is attacked at a time. . . . Among cultivated crops, cotton, corn, fruit trees, sorghum, and many others are attacked. Among wild plants, forest trees are favored, and frequently the Spanish moss is used. The various species of oaks seem to be more or less immune, either on account of the texture of the leaves or the tannic acid they contain." In many cases the attack is concentrated on a single tree, which may be defoliated in a night. The damage to growing crops is frequently heavy and complaints have become more numerous in recent years on account of the greater abundance of the ants.

The best method of control is through the use of a potassium cyanid solution made at the rate of 1 oz. to 1 qt. of water. After carefully mixing this liquid, it should be poured into each of the openings, a quart to each opening. In experiments conducted by J. D. Mitchell it was found that the destruction of the entire colony followed after 1 or 2 applications in this manner. The use of carbon bisulphid is not practical on account of the very extensive excavations the ants make in the sand.

The agricultural or hillock ant (*Pogonomyrmex barbatus molefaciens*) is of economic importance since it will not allow vegetation to grow in the immediate vicinity of its nest and because of the powerful sting which it uses on the slightest provocation. It occurs from the Brazos River westward. West of San Antonio it is replaced by closely allied forms and farther north, in Kansas and Nebraska, a distinct species (*P. occidentalis*) occurs. This ant is conspicuously a resident of open places and does not occur in wooded localities. "The mounds are 15 in. or more in diameter and are frequently covered with particles of earth or sand from beneath the surface which contrast strongly with the surrounding soil. The bare areas around the mound may be 10 ft. or more in diameter."

The most important enemy among the birds is the great-tailed grackle (*Megaquiscalus major macrourus*), commonly known as the jackdaw. Several

additional species are known to prey upon it and the horned toad or lizard (*Phrynosoma cornutum*) includes these ants as a part of its regular diet. The use of a solution of potassium cyanid, as recommended for the cutting or parasol ant, has been found to be a perfectly satisfactory method of destroying them. It is much cheaper and easier of application than in the case of the cutting ant on account of the fact that the underground portion of the nest is much less extensive, a pint of liquid being sufficient for even a large colony, though sometimes a second application may be necessary. Carbon bisulphid is also a good remedy and can be readily applied.

The ants of Guam, W. M. WHEELER (*Jour. N. Y. Ent. Soc., 20 (1912), No. 1, pp. 44–48*).—This paper is based on a collection made by D. T. Fullaway of the Hawaii Federal Station, which is said to be sufficiently extensive to show that the ant-fauna of the little island is made up very largely of the "tramp" species that occur on the other small volcanic Pacific islands such as those of the Society and Hawaiian groups. Twenty-one forms are recorded, of which a subspecies, *Camponotus reticulatus fullawayi*, and a variety, *Prenolepis minutula atomus fullawayi*, are described as new to science.

The control of Solenopsis geminata in cinchona plantations, O. W. BARRETT (*Rev. Agr. [Santo Domingo], 6 (1911), No. 10, pp. 255–258; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 6, pp. 1541, 1542*).—The author recommends the application about the trunks of trees, 2 cm. (0.75 in.) above the soil, of a band from 3 to 5 cm. in breadth, consisting of 3 parts resin, 1 of soda, and 1 of tobacco decoction, and that a second band be placed 15 cm. above the first. For the destruction of ant nests the injection of a mixture of 2 parts resin, 1 of soda, and 1 of tobacco decoction is recommended.

Monograph of the gall-making Cynipidæ (Cynipinæ) of California, D. T. FULLAWAY (*Ann. Ent. Soc. Amer., 4 (1911), No. 4, pp. 331–380, pl. 1*).—Fifteen genera are represented in California by 70 species, of which 18 are here described as new to science.

A key to the genera is included.

The red spider (Tetranychus bimaculatus) on cotton, E. A. MCGREGOR (*U. S. Dept. Agr., Bur. Ent. Circ. 150, pp. 13, figs. 5*).—This circular, which is based primarily upon work done at Batesburg, S. C., in 1911, but includes the results of observations made by G. A. Runner and H. F. Wilson during the 2 preceding seasons, presents a summarized account of present knowledge of the pest. Recent studies of additional material have led Banks to conclude that the name *T. gloveri* is synonymous with *T. bimaculatus*.

Experiments conducted with unmated female red spiders clearly proved that they are normally capable of laying eggs, which in turn hatch and develop into mature individuals. The female lays from 50 to 60 round, colorless eggs which hatch in the summer time in about 4 days.

The newborn spider molts in 2 days to the primary nymph. "In 2 more days (in summer) it, in turn, molts to the secondary nymph. The second nymphal stage lasts 2 days, at the end of which time, after molting, the fully formed adult emerges. Mating occurs at once and egg laying commences immediately afterwards. Thus, 1 generation requires in summer weather in South Carolina about 10 or 11 days. There are probably about 15 generations in an average year in that locality.

"The red spider colonies live on the under side of the cotton leaves, and their constant feeding causes blood-red spots to appear on the tops of the leaves. The effect upon the cotton plant is that the leaves drop, one by one, until usually the plant dies. The pest increases and spreads most rapidly in hot, dry

weather until (toward the end of July) several acres of a field may become badly damaged."

During the season of 1911, which was one of unusual drought, 17 generations were bred at Batesburg, S. C., between March 11 and November 5. "The influence of the weather on breeding activity is very noticeable. Hot, dry conditions greatly favor and hasten development, while cool, wet weather correspondingly retards it. A female laying normally about 6 or 7 eggs per day will often upon the occurrence of a very hot day, suddenly increase the number to 15 or even more eggs per day, or upon a chilly day may drop as suddenly to 1 or 2 eggs. . . .

"When cotton dies or becomes untempting in the late fall an exodus of red spiders from the cotton fields occurs in the effort to find more suitable food plants. At this time cotton mites may be easily found on a number of native and cultivated plants, prominent among which are cowpeas, tomato, Jamestown weed, ironweed, and cultivated violets. Most of these plants die after the frosts, but the violet remains somewhat green throughout the winter, and it is upon this plant, probably, that the vast majority of mites overwinter. . . . In all the red spider has been found in 1911 upon over 50 species of plants, including weeds, ornamental plants, and garden and field crops. Upon most of these the pest was only occasionally seen, but it was found commonly throughout the active season upon beans, cowpeas, dahlia, ironweed, Jerusalem-oak weed, Jamestown weed, okra, tomato, wild blackberry, and wild geranium."

In addition to the anthrocorid bug *Triphleps insidiosus*, 3 species of thrips (*Euthrips fuscus*, *E. occidentalis*, and *Scolothrips sexmaculata*) and several species of lady beetles are mentioned as predaceous enemies of the red spider.

The following remedial and preventive measures are recommended: Burn or grub out all weeds and underbrush about cotton fields and practice fall plowing so far as possible. Spray or destroy suspected violet plants in order to remove the sources of red spider infestation. Thickly sow cotton along margins of fields at points where infestation has appeared on former occasions, and plow these in about June 1, so as to intercept and destroy the invading mites. Maintain a careful watch of fields so that the first attacked plants may be detected, removed, and burned, thus preventing further spread. Apply one of the insecticides described to the infested portion of a field before occurrence becomes so general as to prohibit its use. Two applications should be made; the first to destroy the living mites, and the second, a week later, to kill the recently hatched individuals which were eggs at the time of the first spraying.

All of the following formulas have been found to give good results: Potassium sulphid 3 lbs. to 100 gal. water; flowers of sulphur 15 lbs. and fresh lime 20 lbs. to 100 gal. of water; miscible oil 5 gal. to 100 gal. of water; potassium permanganate, 16½ lbs. to 100 gal. water; miscible oil, 2½ gal. and black-leaf tobacco extract, 40 per cent; and flowers of sulphur, 28 lbs. and soft soap 14 oz. to 100 gal. of water.

Fruit trees damaged by the red spider, R. E. Trumble (*Better Fruit, 6 (1912), No. 10, pp. 27, 28, fig. 1*).—The author reports the red spider to be the source of considerable injury in the Wenatchee Valley, Wash. In 1911 it was the most serious of the enemies of young fruit trees. "While its attacks are by no means limited to young trees, it does its greatest damage on 2- 3- and 4-year-old trees. Often one-half or more of the leaves will be so badly affected that they will fall from the trees, thus limiting the tree's nourishment and checking its growth."

A mosquito larvacide disinfectant and the methods of its standardization, S. T. Darling (*Amer. Jour. Pub. Health, 2 (1912), No. 2, pp. 89–93, fig. 1*).—In the course of work by the Canal Zone sanitary department an efficient larva-

cide made from crude carbolic acid had been prepared, its particular advantages being cheapness, high larvacidal and germicidal powers, miscibility with water, and relative uniform composition. The work of destroying the algæ and mosquito larvæ in the Canal Zone requires an average of 250 bbls. per month, and a plant for its manufacture has been in operation for over 2 years.

To make the larvacide 150 gal. of crude carbolic acid of a specific gravity not greater than 0.97 and containing not less than 30 per cent tar acids "are heated in an iron tank having a steam coil with steam at 50 lbs. pressure. Two hundred lbs. of finely crushed and sifted common resin are dissolved in the heated acid and then 30 lbs. of caustic soda dissolved in 6 gal. of water are added. There is a mechanical stirring rod attached to the tank. The product is ready in a few minutes, yielding about 3½ bbls."

Its cost is shown to be 14.13 cts. per gallon. "The germicidal value when tested with *B. typhosus* in an aquesous emulsion of the larvacide has an R–D coefficient of from 2 to 5. As a mosquito larvacide it is used by spraying an aqueous emulsion (1 part of larvacide to 5 of water) over the surface and along the margins of pools and ponds or other mosquito breeding places so that the resulting dilution of the larvacide has a thin milky opalescence representing approximately a dilution of 1:5,000."

Anopheline larvæ are said to be slightly more resistant than Culex larvæ and all pupæ are more resistant than larvæ to the effects of this larvacide.

The author believes that the theory of Chick and Martin[a] that the removal of an emulsion of tar acids by bacteria is a process of adsorption and not a chemical combination and that disinfectants of this class possess superior efficiency because owing to this adsorption the bacteria rapidly become surrounded by the disinfectant in much greater concentration than exists throughout the liquid, holds true for algæ and protozoa. "When emulsions of larvacide are put up with large quantities of algæ, such as spirogyra, the larvacide loses its turbidity, 50 per cent being lost in some concentrations within 2 hours. Microscopic examinations fail to disclose a cause for this loss of turbidity."

A table which gives the hour after exposure at which anopheline larvæ either die or pupate shows that the efficiency of the larvacide will last for over 7 days. It also shows that when in contact with algæ for a period of 1 to 7 days, 70 per cent of the larvæ are destroyed within 48 hours. "The larvacide hastens pupation, and the algæ control shows that when larvæ are placed in contact with fresh algæ and fresh water the larvæ pupate naturally for several days; decomposition, however, sets in after 110 hours with the formation of a pellicle of bacteria and protozoa on the surface. The anaerobic conditions beneath the pellicle cause the death of algæ and larvæ."

FOODS—HUMAN NUTRITION.

A report on the milling properties of Idaho wheat, J. S. Jones, H. P. Fishburn, and C. W. Colver (*Idaho Sta. Bul. 72, pp. 65, pls. 2*).—Owing to the belief that northwestern grown wheats have a comparatively low milling value, which doubtless materially affects their price in certain markets, extended studies were made of the physical properties, weight per bushel, protein content, and milling value, as well as baking tests under laboratory and home conditions.

The Idaho wheat crop, it is pointed out, consists of a number of varieties grown under very varied conditions, only 3 or 4 being common to north and south Idaho, the two sections of the State where the contrast is greatest in

[a] Jour. Hyg. [Cambridge], 8 (1908), No. 5, pp. 698–703.

climate, soil, and methods of harvesting and marketing. Bluestem and Turkey Red are two well-known varieties useful for comparison between north and south Idaho conditions.

According to the authors' summary, it appears that "in weight per measured bushel, of all varieties encountered, Turkey Red, a hard winter wheat, stands highest; Red Russian, a soft winter wheat, stands lowest; indiscriminately between these two stand hard, semihard, and soft wheats of both winter and spring varieties. It would seem, therefore, that regardless of classification with reference to hardness, high, medium, and low weight per bushel is with Idaho wheat a variety characteristic.

"High, medium, and low protein content is likewise a variety characteristic, but it is far from uniform in any one variety. With Turkey Red it so happens that high average weight per bushel is associated with high average protein content; with Red Russian, low average weight per bushel with low average protein content. Nevertheless, within these or any other varieties the relative protein content of several samples can not with any degree of certainty be predicted from relative weights per measured bushel."

The protein content of Bluestem wheat and of Turkey Red wheat grown with irrigation in southern Idaho and with a rainfall of from 24 to 30 in. in northern Idaho is practically the same, while the protein content of Bluestem and of Turkey Red grown on the dry farms of southern Idaho is greater than when grown under irrigated conditions in the south, or under the humid conditions prevailing in the northern part of the State. "If we may generalize from this, within any one variety, on the basis of its protein content, the wheat of north Idaho, and the irrigated wheat of south Idaho, are practically of the same value for milling purposes. South Idaho dry farmed wheat is superior to either."

It is noteworthy, according to the authors, that in many homes where baking tests were made straight flour obtained from the wheats under consideration was given preference over high patent flours which can be secured in the local markets, "a point which perhaps indicates merely that color in flour is of less importance than heretofore it has been regarded in commercial grinding."

From the laboratory and home baking tests the following conclusions are apparently warranted, in the authors' opinion:

"The crude protein and gluten content of flour from any variety of wheat is a consideration of great importance in fixing its value for bread making purposes; a reasonable amount must be present to insure 'lightness.' But from several lots of flour representing as many different varieties of wheat, or from several lots representing but one variety, the best results in baking are not always obtained from those of greatest gluten content. Influence of ingredients used in 'setting' the sponge and the skill of the baker are considerations which should not be lost sight of. Our leading varieties, viz: Bluestem, Forty Fold, Little Club, Red Chaff Club, and Turkey Red, in the north; Bluestem, Colorado No. 50, Defiance, Dicklow, Gold Coin, and Turkey Red, in the south, at their best, are capable of yielding flour sufficiently rich in gluten to insure the finest quality of light bread. If the best variety of milling wheat is the one which most uniformly produces flour from which the most satisfactory results can be secured in baking, then, of all varieties grown in Idaho thus far examined, Turkey Red is the best."

Wheat bread, É. Fleurent (*Le Pain de Froment. Paris, 1911, pp. 7+223, figs. 33*).—This handbook discusses the composition and nutritive value of wheat and wheat products, bread making, the modern baking industry, and other general questions.

The effect of acids on bread fermentation, A. J. J. Vandevelde and L. Bosmans (*Separate from Verslag. en Meded. K. Vlaam. Acad. Taal en Letterk., 1911, pp. 261–286, dgms. 4*).—From his study the author concludes that under the experimental conditions hydrochloric, nitric, sulphuric, propionic, butyric, and oxalic acid affect bread fermentation unfavorably, and that lactic, tartaric, and citric acid were without effect, while phosphoric, acetic, and benzoic acid had a favorable effect.

He also reports data regarding the effect of these acids upon electrical conductivity, catalysis, inversion, the development of micro-organisms, and other phenomena.

Cotton-seed flour (*Pure Products, 8 (1912), No. 5, pp. 270, 271, fig. 1*).—Information is summarized and suggestions made regarding the use of cotton-seed flour for bread making.

Composition of Indian yams, D. Hooser (*Jour. Asiatic Soc. Bengal, n. ser., 7 (1911), pp. 57–62; abs. in Jour. Soc. Chem. Indus., 30 (1911), No. 16, p. 1027*).—The results are recorded of analyses of 40 specimens of different species of yams (Dioscorea), including both cultivated and wild sorts.

The amounts of crude fiber and ash were much higher in the wild than in the cultivated varieties. Tests showed that an alkaloid (dioscorine) was generally present in the wild tubers (*D. dæmona, D. bulbifera, D. pentaphylla*, and *D. alata*), but not in the cultivated tubers to any great extent. The alkaloid may be removed by soaking the tubers in water.

The narra fruit, H. von Gerard (*Agr. Jour. Union So. Africa, 3 (1912), No. 1, pp. 102–106, fig. 1*).—The use of this wild fruit for food purposes is discussed. In addition to the use of the flesh, the author states that the pits are eaten like nuts and are used for making an oil.

Some Asiatic milk products, D. Hooper (*Jour. Asiatic Soc. Bengal, n. ser., 7 (1911), pp. 63–67; abs. in Jour. Soc. Chem. Indus., 30 (1911), No. 16, p. 1027*).—Analyses are reported of 2 samples of karut, a kind of dried skim milk cheese; chhana, a product obtained by acidifying hot milk; and dahi, a product made by fermenting buttermilk.

A study of Turkish honey, F. Muttelet (*Ann. Falsif., 5 (1912), No. 42, pp. 191–194*).—Details are given of the examination of 12 samples of Turkish honey.

Marmalades, A. McGill (*Lab. Inland Rev. Dept. Canada Bul. 233, 1912, pp. 25*).—Details are given of the examination of 154 samples of marmalade collected throughout Canada. Of these, 14 samples contained glucose in amounts varying from traces to about 25 per cent.

Vinegars, A. McGill (*Lab. Inland Rev. Dept. Canada Bul. 235, 1912, pp. 31*).—Data are reported regarding the examination of 151 samples of goods sold as cider, malt, and wine vinegars.

The aromatic substances of foods and condiments (*Pure Products, 8 (1912), No. 5, pp. 264–270*).—A descriptive summary.

On the absorption and distribution of aluminium from aluminized food, M. Kaun (*Biochem. Bul., 1 (1911), No. 2, pp. 235–244*).—Tests, 3 in number, were made with dogs and covered from 52 days to 2 months. The general conclusions which were drawn follow:

"When biscuits baked with alum baking powder are fed in a mixed diet to dogs, aluminium passes in considerable amounts into the blood.

"Such absorbed aluminium circulates freely and, although it does not show a tendency to increase proportionately in the blood, it accumulates to some extent in various parts of the body. The bile contains a particularly large amount of aluminium under such circumstances. The pancreas, liver, muscle, and kidneys contain considerable amounts, while the brain and heart seem to

resist accumulation of aluminium. The long bones, under the conditions of these experiments, contained aluminium. The flat bone of the skull did not contain aluminium.

"Aluminium, when ingested in aluminized food under the conditions of these experiments, is absorbed in part and is excreted, to some extent, in both the bile and urine."

The presence of arsenic in some vegetable food materials, F. JADIN and A. ASTRUC (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 14, pp. 893–896*).—Arsenic was found in a large number of samples of vegetable products and fruits, fresh and dried, nuts, and edible fungi, the amounts ranging from 0.003 mg. per 100 in wild leek (*Allium polyanthum*) to 0.026 mg. per 100 in dried peas.

Food inspection decisions (*U. S. Dept. Agr., Food Insp. Decisions 143, 144, pp. 1 each*).—These decisions have to do respectively with the labeling of candied citron and the use of excessive amounts of water, brine, sirup, sauce, and similar substances in the preparation of canned foods.

The sanitary regulation of the oyster industry, F. P. GORMAN (*Amer. Jour. Pub. Health, 2 (1912), No. 2, pp. 77–84*).—From the data summarized the author concludes that the improvement of the shellfish industry involves "prohibition of the practice of floating oysters; prohibition of the use for food of shellfish taken from waters directly polluted with sewage, that is, within a certain distance of discharging sewers; careful sanitary regulation and supervision of the methods of handling and packing shellfish; [and] efforts to secure the removal of sewage pollution from the tidewaters where shellfish are grown, or at least the disinfection of all sewage effluents which enter tidewater."

The paper is followed by a discussion.

The preservation of food, ALICE RAVENHILL (*Brit. Columbia Dept. Agr. Bul. 37, 1912, pp. 19, figs. 10*).—This bulletin, which is one of a proposed series for the women's institute work, discusses methods of handling and keeping food, the preservation of foods in the home, and other similar questions.

Southwest Africa camp food, H. FISCHER (*Illus. Landw. Ztg., 32 (1912), No. 26, pp. 246, 247, figs. 3*).—Native foods are described and their uses discussed.

How I lived on threepence a day, F. J. CROSS (*London, 1912, pp. 124, charts 8*).—The author reports and discusses his experience living for a week on a diet costing 6 cts. a day, a sum which he states is comparable with that which many workingmen's families have to spend per person for food. His general conclusion is that, with limited incomes, knowledge and care in the selection and preparation of food are absolutely essential if persons are to be well nourished. In addition, the volume, which is designed for the instruction of housekeepers, discusses such subjects as the relative nutritive value of different foods, suitable foods for working class households, and other questions.

The introduction is contributed by R. Hutchison.

Cooperation and cost of living in certain foreign countries (*U. S. House Representatives, 62. Cong., 2. Sess., Doc. 617, 1912, pp. 248*).—A large amount of data collected by United States consuls, regarding the cost of food, the work of cooperative societies, and the cost of living in certain foreign countries, is brought together, this material being preceded by a letter of transmittal by H. Wilson which gives a summary of the prices of common food materials in recent years in the United Kingdom.

The school feeding movement, LOUISE S. BRYANT (*Psych. Clin., 6 (1912), No. 2, pp. 29–43*).—An account of the origin and development of the movement

to provide food for school children, which summarizes a large amount of statistical and other data.

A bibliography is included.

The training of the school dietitian, MARY S. ROSE (*Psych. Clin., 6 (1912), No. 2, pp. 52–55*).—Suggestions are made regarding the training required by a school dietitian, a profession which the author believes will become an important factor in education in boarding institutions and in the public schools of large cities.

Administration of school luncheons, ALICE C. BOUGHTON (*Psych. Clin., 6 (1912), No. 2, pp. 44–51, fig. 1*).—An account is given of the school luncheon movement in Philadelphia, considered particularly as a business project.

The economy of food, J. A. MURRAY (*London, 1911, pp. XII+253, figs. 13*).—This popular treatise on nutrition discusses the physiology and chemistry of nutrition, the quantity of food required, the nutritive value and general properties of meats, vegetables, and other foods, ordinary diets, special diets, and similar questions.

An explanation of hunger, W. B. CANNON and A. L. WASHBURN (*Amer. Jour. Physiol., 29 (1912), No. 5, pp. 441–454, figs. 3*).—In this paper the authors summarize and discuss hunger as distinguished from appetite, on the basis of their own investigations and the work of others. Of the two theories of hunger, the one that it is a general sensation with a local reference, and the other that it has a local peripheral source, they point out that the former has been the more widely accepted. The support for this theory, however, can be shown to be unsubstantiated.

In general, "hunger . . . is normally the signal that the stomach is contracted for action; the unpleasantness of hunger leads to eating; eating starts gastric secretion, distends the contracted organ, initiates the movements of gastric digestion, and abolishes the sensation. Meanwhile pancreatic and intestinal juices, as well as bile, have been prepared in the duodenum to receive the oncoming chyme. The periodic activity of the alimentary canal in fasting, therefore, is not solely the source of hunger pangs, but is at the same time an exhibition in the digestive organs of readiness for prompt attack on the food swallowed by the hungry animal."

Investigations into the jail dietaries of the United Provinces, with some observations on the influence of dietary on the physical development and well-being of the people of the United Provinces, D. MCCAY (*Sci. Mem. Med. and Sanit. Depts. India, n. ser., 1911, No. 48, pp. 2+3+II+200*).—Continuing previous investigations (E. S. R., 24, p. 568), an extended study was made of the dietaries in a number of Indian jails and experiments were carried on with reference to the digestibility of protein and carbohydrates of certain foodstuffs and combinations. In addition, the author studied the jail dietaries with reference to their salt content, the excretion of chlorids in the urine, the quantity of feces and urine excreted, the nitrogen content of the feces, and the effect of an increase or decrease in wheat consumed on the quantity of feces.

On an average the present diet made up of wheat, legumes, barley, vegetables, oil, and other similar vegetable foods, supplied 106.81 gm. protein per man per day, of which 72.81 gm. was digestible. The energy value ranged from 3,122 to 3,450 calories.

"Taking the whole year into consideration the dietaries of the jails of the United Provinces present an average daily intake of . . . 104.56 gm. protein per man, and are accompanied by an average daily absorption of . . . 69.50 gm. protein per man."

In the author's opinion "the defects of most of these diets are such as to lessen their nutritive value to a very serious extent, with the result that while,

according to their chemical composition, they appear to be superior to the English prison scales and even to most of the standard dietaries, in reality they are much inferior. The explanation for this will be found to be the low degree of protein absorption shown by the foodstuffs entering into the composition of the dietaries of the jails of the United Provinces."

Studies of digestibilty showed a considerable range. The coefficient of digestibility of protein of ordinary jail wheat was found to be 67.1 per cent, a value considerably lower than that of first quality wheat. In general, the digestibility of the legumes studied was also lower than that of first quality wheat. The average digestibility of total carbohydrates in the jail dietaries was found to be 96.4; the carbohydrates of wheat, 96.5; and, in general, 92 per cent or over for the individual materials and combinations under consideration.

The author does not believe that the present dietaries contain an excessive amount of protein. "While acknowledging the force of the different arguments for the reduction of the level of protein metabolism, we have had sufficient evidence in our work in India to confirm us in the opinion that a liberal supply of absorbable protein is the all-important element of a diet, without which, no matter how plentiful the other constituents may be, physical fitness, capacity for work, and power of resisting disease can not be expected."

On the basis of the investigation a number of suggestions are made for improving the dietaries and for making them more economical. A series of 8 diets is given which are practically of identical nutritive values, and interchangeable, the particular diet in use at any stated time depending on the season of the year and on the food materials available.

In the section which deals with the relationship of food to physical development much detailed information is given regarding the food and physical condition of Brahmins, sikhs, Pathans, and other natives. In some cases the diet is principally vegetarian; in others vegetables and dairy products are used; while in others a mixed diet is followed.

In general, it is the author's opinion that the more generous the diet the more satisfactory the physical condition and general well-being. "From the facts we have been able to collect with regard to the inhabitants of the United Provinces and martial races of the plains, there would appear to be abundant evidence that, other things being equal, diet is the all-important factor in determining the degree of physical development and general well-being of a people, and that with a low level of nitrogenous interchange deficient stamina, morally and physically, must be expected."

The effect of a strictly vegetable diet on the spontaneous activity, the rate of growth, and the longevity of the albino rat, J. R. SLONAKER (*Leland Stanford Jr. Univ. Pubs., Univ. Ser., 1912, pp. 36, pl. 1, figs. 15*).—Using 2 groups of young rats the same age and as nearly as possible of the same parentage, the author studied the effects of a vegetable diet in comparison with the same diet plus animal food.

According to his conclusions, the omnivorous feeders were more active and voluntarily did much more work than the rats on a vegetarian diet, the average ratio of efficiency being 7.5:1. The females surpassed in activity the males of the same group, the difference being greater with the omnivorous rats than with those receiving the vegetable diet. The difference was not very noticeable until the experiment had proceeded 2 or 3 months or until about one-fifth of the total life of the rats on the vegetable diet had been lived. "One can not conclude, therefore, that a diet used for a few weeks is not injurious if no bad results occur during that time.

"The total work accomplished by the vegetarians during their life was performed by the omnivorous rats when but 20.9 per cent of their lives had been lived.

"The vegetarian rats age much earlier in life, it requiring almost half their lifetime to perform the last one-eighth of their life's work, as compared to three-tenths for the omnivorous rats.

"The growth of the vegetarians was greatly retarded. The ratio of maximum weights was a 1.62:1 in favor of the omnivorous feeders.

"The effect on general conditions of the body was most overwhelmingly in favor of the omnivorous. The vegetarians were frail, weak, and showed extreme lassitude and indifference. The omnivorous were the reverse in all these respects.

"The average life of the omnivorous was 1,020 days, that of the vegetarian 555 days. This was a ratio of 1.84:1.

"The control rats in stationary cages lived longer than the exercised rats of the same group.

"All of the omnivorous rats surpassed the greatest age attained by the oldest vegetarian rats.

"From numerous observations and experiments of other investigators on man we would infer that similar results would obtain if he were subjected to similar conditions throughout his lifetime."

Effects of coffee drinking upon children, C. K. TAYLOR (*Psych. Clin., 6 (1912), No. 2, pp. 56–58*).—Statistics were obtained from 464 children with respect to coffee drinking, and physical measurements were made, as well as observations regarding the character of their school work.

It was found that about 29 per cent of these children drank no coffee, 46 per cent a cup a day, 12 per cent 2 cups, 8 per cent 3 cups, and the remainder 4 or more cups a day. The statistics obtained, according to the author, "are hardly sensational," but he believes that "if such differences exist between the mental ability, as shown by lesson work, and behavior, as shown by conduct marks, of those drinking and those not drinking coffee, this beverage must have some unwholesome effect upon children that it does not have upon adults."

As regards physical measurements, "the children concerned in this test who drank coffee regularly averaged from 1½ to more than 4 lbs. less in weight, from ½ in. to more than 1 in. less in height, and all the way to 3 lbs. less in hand strength than those who never drank coffee. These differences may not be startling, but it is evident that there are differences.

"As a conclusion, then, to this very brief paper, the writer would say that it seems likely that the regular drinking of coffee by children has an effect which is certainly not beneficial, that indeed it seems to make children less 'fit' physically as well as mentally than those who do not use coffee. If this be true, then some support is given to the modern movement which advocates the substituting of cocoa or chocolate for coffee as a beverage for children."

The cleavage of xanthin and caffein in the human body, W. LEVINTHAL (*Hoppe-Seyler's Ztschr. Physiol. Chem., 77 (1912), No. 4, pp. 259–279*).—From an experimental study of the subject the conclusion is reached that very probably the xanthin metabolized by man is excreted quantitatively without breaking the purin ring, the greater part being oxidized to uric acid and the small remainder leaving the body unchanged.

On fat absorption, W. R. BLOOR (*Jour. Biol. Chem., 11 (1912), No. 4, pp. 429–434*).—The results obtained in experiments with dogs show quite conclusively, according to the author, "that none of the isomannid esters had passed unchanged into the chyle, although considerable quantities had been digested and absorbed." This result, which is in accord with work which has been

previously reported, "emphasizes the probability that readily saponifiable fatty acid esters do not escape saponification under the favorable conditions in the normal intestine (excess of lipase, rapid removal of the products). Whether fatty substances of any kind may pass into the chyle unchanged remains to be proven."

The chemical analysis of the ash of smooth muscle, E. B. MEIGS and L. A. RYAN (*Jour. Biol. Chem., 11 (1912), No. 4, pp. 401–414*).—Experiments are reported and data summarized. According to the authors, the facts at present known point to the following conclusions in regard to smooth muscle:

"The fibers of this tissue are not surrounded by semipermeable membranes.

"Most of the water of the smooth muscle fibers is held by the colloids of the living tissue as organic water.

"Most of the potassium, phosphorus, sulphur, and magnesium, which appear in the ash of smooth muscle, are present in the living tissue in a nondiffusible form."

Metabolism during mental work, A. LEHMANN (*Umschau, 16 (1912), No. 19, pp. 390, 391*).—A brief summary of a paper presented at the Congress of Experimental Psychology in Berlin. The mental work in the experiments consisted in adding simple numbers or in committing to memory syllables arranged without reference to meaning.

The author concludes that under controlled conditions such mental work caused an increase of carbon dioxid excreted which is directly comparable with that noted in the case of physical work. The increased carbon dioxid production was proportional to the severity of the mental work as measured by attention.

A new ice chest, C. ZELMANOWITZ (*Biochem. Ztschr., 39 (1912), No. 1–2, pp. 151–154, fig. 1*).—An ice chest designed for laboratory use is described in which a current of air is driven into the ice chamber and kept in continuous circulation by means of a small electric motor. The front of the ice box contains a number of small doors, the object being to lessen the rise of temperature when articles are placed in it or removed. Even when due allowance is made for the cost of the motor and power, the ice chest has been found more economical than one cooled with ice in the usual way, according to the author.

[The ideas embodied in the construction of this ice chest might prove useful in ice chests for institution use or for some similar purpose.]

ANIMAL PRODUCTION.

The vitality of reproductive cells, L. L. LEWIS (*Oklahoma Sta. Bul. 96, pp. 3–47, figs. 7*).—This contains a description of the reproductive glands of horses, cattle, swine, and mules, and a report of experimental work on the vitality of spermatozoa and ova, being a continuation of earlier work (see page 274).

Measurements of the sperm cells from horses, cattle, and swine are given, showing that there was but little variation in size for different individuals of the same species. In a number of experiments in keeping semen of stallions at temperatures from 12 to 52° C., the high temperatures were found to be quickly fatal to the sperm cells. Keeping the semen in rubber and pig bladder, or adding water or other materials, reduced the vitality. Semen-like material from male mules contained no sperm cells.

"Under experimental conditions the vitality of the sperm cells from the boar continues approximately 15 to 25 hours after the semen is collected. The length of time depending upon the temperature at which the semen is kept, and the vigor and physical condition of the animal used in the experiment. Temperature has much the same effect on the vitality of the semen from the

hog as it has on that collected from the horse. . . . Semen from different males varies greatly in its vitality under laboratory conditions. This difference is sometimes so noticeable as to indicate the probability of poor breeding qualities."

To determine the vitality of sperm cells in the female, sows were killed at varying lengths of time after service. Of the 19 sows bred and killed the sperm cells were found dead in 80 per cent of the cases where a period of 16 hours or more had elapsed. In one case the live cells were found after a lapse of 22½ hours, and in 2 cases after a lapse of more than 40 hours. Vitality tests with the sperm of horses showed it to be very short-lived either in the mare or under abnormal conditions.

To learn of the effect of continuous service, a heavy draft stallion was used once each day. The number of sperm cells present in the semen in his first service was 131,750 per cubic millimeter, and live cells were found 95 hours after service when kept at from 31 to 35° C. After the ninth service there were only 5,840 sperm cells per cubic millimeter, and the vitality of the cells was less than one-half as compared with those of the first cells. Other experiments for 11 days' and 18 days' consecutive service showed that the vitality was reduced from the first to the last service. Chemical analyses of the sperm cells are given.

Experiments were also made to determine the time of the rupture of the Graffian follicles and the vitality of the ova in sows. "If the hog was killed early in the period of heat the follicles showed perfect and unruptured, while those from hogs killed a few hours later showed the follicles ruptured. A few sows were killed when not in heat, and in none of these were the follicles found well developed or in condition to liberate the ovum, neither did they show any signs of the recent escape of the ovum from the organ. Variations from the normal no doubt do occur, but it is safe to assume that in the great majority of cases the follicles do not rupture before 30 hours after the period of heat begins." Whenever sows were bred out of heat no results were obtained unless it occurred within 1 day. Post-mortem examinations after breeding out of heat indicate that the ovum and sperm cells soon lose their physiological activity after they become separated from the ovary and testes.

"The vitality of the reproductive cells of the hog is only a few hours. In most cases the ovum appears to lose its power of being fertilized within 48 hours, and the sperm cell does not appear to possess much, if any, greater vitality. . . . The ovum (in hogs) is not liberated from the ovary until the last part of the period of heat."

Artificial insemination, L. L. LEWIS (*Oklahoma Sta. Bul. 93, pp. 3–13, figs. 5*).—A revised edition of a bulletin previously noted (E. S. R., 17, p. 1193), with a brief report of experiments which are more fully noted in Bulletin 96 (see page 273).

Is the control of embryonic development a practical problem? C. R. STOCKARD (*Abs. in Science, n. ser., 35 (1912), No. 907, p. 788*).—This is an abstract of a paper read before the American Philosophical Society, 1911, which discusses the factors which cause embryonic deformities in man and animals. These may be distinguished as those caused by the embryo developing in an unfavorable environment, and those in which the germ cells of both parents may have been defective.

The results of experiments with guinea pigs have shown that when put into a state of chronic alcoholism and mated together or with normal individuals, the resulting offspring were greatly affected, showing that the paternal germ cells are affected by the alcohol and produce abnormal offspring. It is sug-

gested that there may be some means of controlling the chemical environment of the developing germ.

On Mendelian dominance, A. R. MOORE (*Arch. Entwickl. Mech. Organ., 34 (1912), pt. 1, pp. 168–175, figs. 9*).—In support of a hypothesis, previously noted (E. S. R., 23, p. 778), the author cites a number of experiments with invertebrates by which incomplete dominance can be explained on biochemical grounds.

"According to our hypothesis that the substances underlying the formation of dominant characters obey the laws governing enzym reactions, we should expect these reactions to go forward at a slower rate in the heterozygote than in the pure dominant because the former contains but one-half the amount of enzym to be found in the latter."

A simplified method of calculating frequencies of occurrence from a large number of unequal probabilities, A. G. MCKENDRICK (*Biometrika, 8 (1912), No. 3–4, pp. 413–419*).—This biometric method of determining whether the distribution is regulated by laws of chance or by other factors is illustrated by applying it to a study of the recurring attacks of disease in epidemics.

Factors affecting the secondary sexual characters, E. STEINACH (*Zentbl. Physiol., 24 (1910), No. 13, pp. 551–560; 25 (1911), 17, pp. 723–725; Jour. Amer. Med. Assoc., 58 (1912), No. 7, p. 484*).—Testes and ovaries of rats and guinea pigs were transplanted into early castrates of the same and the opposite sex. The tissues maintained their integrity and exerted an influence on the sex characters. Neither the somatic nor the psychic secondary traits were fixed in the individual. They developed under the domination of the respective glands which were present and functionally active.

Contribution to the study of experimental determination of sex, I. BONAZZI (*Arch. Ital. Biol., 56 (1911), No. 3, pp. 433–447, figs. 8*).—Following the methods used by Ducceschi and Tallarico[a] an orchitoxic serum obtained from sheep was injected into rabbits. It was without apparent influence on the sex ratio but had a tendency to produce sterility and abortion. This opinion was confirmed by an examination of the ovarian tissue of the treated rabbits.

Another sex-limited character in fowls, A. H. STURTEVANT (*Science, n. ser., 33 (1911), No. 844, pp. 337, 338*).—A preliminary report of experiments in crossing Columbian Wyandottes and Brown Leghorns.

An experiment dealing with sex-linkage in fowls, A. H. STURTEVANT (*Jour. Expt. Zool., 12 (1912), No. 4, pp. 499–518, figs. 4*).—A continuation of work noted above, and summarized as follows:

"There is a sex-linked factor carried by the Columbian Wyandotte—an inhibitor for red in the plumage. This breed probably also carries another sex-linked factor, an inhibitor for red in the neck. It apparently carries a pattern factor inhibiting the breast color, and, in the female, the stippled back of the Brown Leghorn. The silver-gray color is probably epistatic to the Jungle fowl or brown color. The White Wyandotte is a silver-laced breed with a color producer dropped out.

"An attempt is made to explain three sets of phenomena, in fowls, in canaries, and in Aglia tau respectively, as cases of partial sex-linkage. Using this explanation, it is argued that the sex formula for birds and Lepidoptera is probably: ♂, MM, FF; ♀, *Mm*, FF. The case of the dwarf guinea pig is explained as perhaps representing partial sex-linkage in a form where the male is heterozygous for sex."

A bibliography is appended.

[a] Arch. Fisiol., 1 (1904), p. 604.

The correlation of body weight and egg production in fowls, G. WILNINGER (*Wiener Landw. Ztg., 62 (1912), No. 26, pp. 320, 321*).—Some of the results obtained from a study of the correlation between the weight of the hen and of the eggs laid are summarized in the following table:

Average weight of hens and of eggs laid per hen.

Breed.	Average weight of hen.	Average total weight of eggs per year.	Average weight of 1 egg.
	Kg.	*Kg.*	*Gm.*
Italian partridge:			
General average of the flock for 7 years	2.259	7.865	58.6
Average of 5 best layers	2.125	8.730	57.8
Average of 5 poorest layers	2.409	6.849	59.5
Golden Wyandotte:			
General average of the flock	2.549	8.641	57.3
Average of 5 best layers	2.476	10.245	57.2
Average of 5 poorest layers	2.650	6.743	57.1

Hybridization of canaries, A. R. GALLOWAY (*Biometrika, 8 (1912), No. 3-4, pp. 435, 436*).—An explanatory note concerning the author's paper, previously noted (E. S. R., 22, p. 172).

[The significance of the chemistry of the proteins in animal nutrition], T. B. WOOD (*Trans. Highland and Agr. Soc. Scot., 5. scr., 23 (1911), pp. 84–93*).—The aim of this article is to show the practical value to the stock feeder of the new points of view of the physiological chemists in regard to proteins that the value of a protein may vary greatly according to the amino acids into which it may be decomposed. The quantity of protein necessary for an animal varies considerably, being smaller the nearer the composition of the protein of the feed approaches that of the protein of the animal tissues. As farm stock nearly always received a mixed diet, the constituents of which can be varied within certain limits, these mixtures are ordinarily successful because the protein of the several ingredients of the diet are complementary to each other.

Experiments are cited to show that the successful stock feeder of the future must know something of the nature of the amino acids contained in the proteins of the different feeding stuffs.

Starch values and fodder units, O. JENSEN (*Milchw. Zentbl., 41 (1912), No. 6, pp. 161–165; Molk. Ztg. Berlin, 22 (1912), No. 19, pp. 217, 218*).—This gives the author's views regarding the formulation of rations by means of starch values and fodder units.

Starch values and fodder units, trans. by J. H. MONRAD (*Hoard's Dairyman, 43 (1912), No. 15, pp. 586, 587, 590*).—This is a translation of the above.

[Alpine pasture lands], E. MARCHETTANO (*Separate from Bol. Assoc. Agr. Friulana, 1911, pp. XV+150, map 1; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 2, pp. 514–521*).—A general statistical article on Alpine pasture lands in the Province of Udine, Italy, with special reference to the work of the agricultural association of Friuli.

The rate of evolution of hydrocyanic acid from linseed under digestive conditions, S. H. COLLINS (*Proc. Univ. Durham Phil. Soc., 4 (1911–12), No. 3, pp. 99–106, figs. 2*).—Linseed meal was digested at temperatures approaching those of animal life, and the hydrocyanic acid and other volatile products removed by a stream of inert gas. The amount of hydrocyanic acid produced depended upon the amount of cyanogenetic glucosid, the amount of enzym, the temperature, and the degree of acidity of the liquid, as well as on the presence or absence of a number of other substances. The conclusion is

reached that in normal health, the acidity of the stomach is too high for the production of hydrocyanic acid from linseed, but abnormal circumstances may cause its production.

"The above research explains the paradox that while a farmer considers linseed one of the safest cattle foods and uses it for calf rearing, yet the chemist shows that linseed in the laboratory readily gives off prussic acid, one of the most deadly poisons.

"Further, this research suggests a possible explanation of certain rare and puzzling cases of cattle poisoning. Should a linseed, rich in cyanogenetic glucosids, be fed to a beast suffering from indigestion of such a peculiar character that the food was not rendered acid, then prussic-acid poisoning might set in. Such a combination of circumstances must be very rare, but is by no means impossible."

The Pandacan forage factory, Z. K. MILLER (*Philippine Agr. Rev. [English Ed.], 5 (1912), No. 3, pp. 133–141*).—Brief reports are made on drying and storing corn, testing grain rations, and artificially drying forage.

Experiments made in crushing and drying grasses and green forage plants showed that the cost was too high to be practicable. The experiments will be repeated when a more economical dryer is obtained, as artificial drying of forage is a necessity during the rainy season, or until irrigation systems can be installed so that forage plants can be grown in the dry season.

Cooked yeast as a feed for cattle, J. PAECHTNER (*Wchnschr. Brau., 29 (1912), No. 16, pp. 225–227, fig. 1*).—Methods of utilizing waste yeast from breweries as a feed for live stock are discussed, and a contrivance for cooking fresh yeast by means of a coiled steam pipe is described.

Cattle breeding, H. WERNER (*Die Rinderzucht. Berlin, 1912, 3. ed., rev. and enl., pp. XII+756, pls. 128, figs. 106*).—In this revision many changes have been made, especially in the sections devoted to breeding and feeding.

The organization of the bovine breeding societies in France, M. VACHER (*Jour. Soc. Cent. Agr. Belg., 59 (1912), No. 6, pp. 153–162*).—This discusses the nature of the cattle breeders' associations in France and the results which they have accomplished.

The origin and ancestry of Norwegian cattle, J. FROST (*Milchw. Zentbl., 41 (1912), No. 4, pp. 117–121*).—According to the author's views, which are similar to those of Dettweiler (E. S. R., 26, p. 166), the first domesticated cattle and horses in Norway were brought from Freisland or Jutland in Neolithic times, are of the same origin as the Finnish stock, and are black or black and white in color. Red cattle were introduced at a later period and are of German origin.

The important blood lines of the black and white East Friesian cattle, GROENEWOLD (*Arb. Deut. Gesell. Züchtungsk., 1912, No. 13, pp. 101, tables 10, pls. 17*).—This contains pedigrees, milk records, photographs, and other data of many noted animals of this breed.

The Harz cattle, GEORGS (*Mitt. Deut. Landw. Gesell., 27 (1912), No. 19, pp. 276–279*).—A description of the characteristics of the cattle in the region of the Harz Mountains, and a discussion of the methods of feeding, breeding, and managing.

Imported stock and their progeny, M. A. O'CALLAGHAN (*Agr. Gaz. N. S. Wales, 23 (1912), Nos. 2, pp. 93–108, pl. 1, figs. 11; 4, pp. 315–332, pls. 4, figs. 13*).—Milk records and other data of cows imported to New South Wales, belonging to the Shorthorn, Ayrshire, Jersey, and Guernsey breeds, are reported.

Caracul sheep, H. KRAEMER (*Mitt. Deut. Landw. Gesell., 27 (1912), No. 17, pp. 243–246*).—A discussion of the effect of soil, climate, feed, and other factors

on the character of the fleece of caracul lambs, based largely on results of work previously noted (E. S. R., 25, p. 175).

Goats: Their use and management, H. S. H. PEGLER (*Trans. Highland and Agr. Soc. Scot., 5. ser., 24 (1912), pp. 52–77, figs. 6*).—The principal topics treated are the breeds of goats, feeding, management, and milk yields.

The Angora and mohair industry in the Northwest (*Portland, Oreg. [1911], pp. 69, figs. 54*).—This is a report of the proceedings of the first annual convention of the Northwest Angora Goat Association, held at Portland, Oreg., January, 1911, including several addresses on the subject of breeding, feeding, and handling goats.

[Feeding experiments with pigs], W. A. LINKLATER (*Oklahoma Sta. Rpts 1910–11, pp. 18–30, figs. 5*).—A feeding test with 32 young pigs is summarized in the following table:

Rations for growing pigs.

Rations.	Average gain per head and day.	Corn required for 100 lbs. gain.
	Lbs.	*Lbs.*
Corn meal (full ration)	0.38	407
Corn meal (full ration), green alfalfa (ab libitum)	.52	294
Corn meal (half ration), green alfalfa (ab libitum)	.38	203
Corn meal (quarter ration), green alfalfa (ab libitum)	.22	136
Corn meal (quarter ration), green rape (ab libitum)	.12	242
Corn meal (half ration), green rape (ab libitum)	.26	293
Corn meal (full ration), green rape (ab libitum)	.46	333
Corn meal (7 parts), tankage (full ration), 1 part	.39	347

In another test with 20 pigs lasting 160 days, on a ration of corn chop, buttermilk, and barley and sorghum forage the average daily gain was 0.51 lb., as compared with a gain of 1.22 lbs. on corn chop and buttermilk. A lot of hogs turned into a field of corn yielding at the rate of only 17 bu. per acre made a gain of 1.2 lbs. per head. Estimating the value of the grain at 7 cts. per pound, the hogs returned a value of 63.15 cts. per bushel.

A test of ear corn *v.* ear corn and supplementary feeds for 16 hogs averaging about 209.5 lbs. in weight gave the following results: On ear corn alone the average gain per head and day was 1.02 lbs., at a cost of 4.57 cts. per pound; on corn and tankage, a gain of 1.09 lbs. at a cost of 4.74 cts. per pound; on corn and alfalfa meal, a gain of 1.02 lbs., at a cost of 5.3 cts. per pound; and on corn and alfalfa hay, a gain of 0.96 lb., at a cost of 5.76 cts. per pound.

Hog feeding, W. A. LINKLATER (*Oklahoma Sta. Bul. 94, pp. 3–16, figs. 2*).—The first experiment reported in this bulletin was on the value of alfalfa forage for hogs with and without grain. Pigs averaging about 75 lbs. in weight were turned on an alfalfa field in April. At the end of 100 days the average daily gain was 0.26 lb. per head when on alfalfa alone; on alfalfa and all the dry corn chop they would eat the gain was 1.28 lbs. per head and day; on alfalfa and a half ration of corn chop the gain was 0.70 lb.

In a test of the value of cotton-seed meal as a supplementary feed, with 3 lots of 4 hogs each weighing about 100 lbs., the average daily gain per head for 77 days was as follows: On corn chop and cotton-seed meal in the proportion or 4:1, 1.05 lbs.; on the same feeds in the proportion of 6:1, 1.2 lbs.; in the proportion of 8:1, 1.18 lbs. The financial statements, however, were most favorable for the first lot.

Some advice is offered concerning the management of swine and the economical production of pork.

The brood sow and her litter, J. M. EVVARD (*Breeder's Gaz., 61 (1912), No. 7, p. 395, figs. 2*).—Thirty-five grade and pure-bred Duroc-Jersey gilts were divided into 7 equal lots. Corn was made the basis of all rations fed. The supplements tested were meat meal, mixed grains, clover hay, molasses, and alfalfa. The results are summarized in the following table:

Influence of the sow's feed on the offspring.

Supplement.	Average number in litter.	Average weight of litter.	Average weight per pig.	Average number of pigs saved per sow at weaning.
		Lbs.	*Lbs.*	
None	7.6	13.20	1.74	5.2
1 lb. meat meal to 30 lbs. ear corn	7.4	14.89	2.01	6.2
4 lbs. meat meal to 30 lbs. ear corn	8.8	19.62	2.23	7.0
Grain mixture	10.6	19.50	1.84	7.4
Cut clover and molasses	7.0	15.32	2.19	4.6
Clover in rack	6.4	14.17	2.21	5.6
Alfalfa in rack	7.6	17.41	2.29	6.4
Average of all	7.9	16.30	[a] 2.07	6.1

[a] Average weight of all pigs born.

Bacon curing on the farm, L. M. DOUGLAS (*Trans. Highland and Agr. Soc. Scot., 5. ser., 24 (1912), pp. 102–119, figs. 12*).—This describes the bacon type of hog, the equipment for curing bacon, and methods of cutting and curing.

The stallion law and the farmer (*Kansas Sta. Circ. 23, pp. 4*).—This circular explains the reason for enacting the state stallion law, and offers suggestions to horse breeders for improving their breeding stock.

Profitable poultry raising, J. S. JEFFREY (*North Carolina Sta. Bul. 221, pp. 89–108, figs. 7*).—This discusses methods of raising and feeding chicks, and contains a brief report of a feeding experiment lasting 6 months, in which a large part of the feed consisted of grain that was not marketable. The cost of feed per dozen eggs laid during this period was 9 cts. for the Barred Plymouth Rocks and 8.45 cts. for the Rhode Island Reds. Types of poultry houses and an oat sprouter are also illustrated and described.

The utility poultry industry in Scotland, W. BROWN (*Trans. Highland and Agr. Soc. Scot., 5. ser., 24 (1912), pp. 236–249*).—This is a statement of the present status of the poultry industry, a description of the efforts now being made to encourage poultry keeping, and a review of results which have already been secured.

Farm poultry, F. C. ELFORD (*Bul. Macdonald Col., 1912, pp. 59, figs. 31*).—This is a popular bulletin, covering all phases of the poultry industry.

Exportation of eggs from Bulgaria (*Handels Museum, 26. (1911), I, No. 21, p. 327; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 6, p. 1428*).—Statistical data on exports of eggs from Bulgaria for a number of years are given. Most of the eggs at the present time are sent to Germany, whereas formerly they were exported to Austria.

Oregon Station trap nest, J. DRYDEN (*Oregon Sta. Circ. 19, pp. 4, figs. 2*).—A description of this trap nest has been previously noted (E. S. R., 21, p. 75).

The retail butcher, R. S. MATTHEWS (*Memphis, Tenn. [1911], pp. 101, pl. 1, figs. 4*).—This contains advice on slaughtering animals, and also recipes for curing ham and bacon, drying beef, and making sausage and head cheese. Prices at which meat must be sold in order that the butcher may make a profit are presented in tabular form.

DAIRY FARMING—DAIRYING.

Influence of fatness of cow on percentage of fat in milk, C. H. Eckles (*Missouri Sta. Bul. 100, pp. 183–202, figs. 12*).—This contains records of the station herd in addition to those previously noted (E. S. R., 23, p. 179), which show that on a restricted ration the percentage of milk fat may be abnormally increased for some time after calving if the cow is in a fat condition, and that the percentage of milk fat gradually increases with the advance in lactation for the cows moderate to thin in flesh.

Data are also taken from the advanced register of the Holstein-Friesian Cattle Association, and submitted as further proof that the percentage of fat may be abnormally high when the cow is in a fat condition at calving. One cow was entered in the advanced register with an official test of 4.09 per cent fat, although her average for the year was 2.76 per cent. Similar results are recorded for Ayrshires and Jerseys.

The following conclusions are drawn: "The percentage of fat in milk can be influenced to a marked extent for the first 20 to 30 days by the fatness of the animal at parturition. This influence appears to extend in some cases in a less degree for at least 3 months. Underfeeding of the animal after parturition seems to be a necessary condition to bring about this abnormal percentage of fat in the milk.

Tests of dairy cows made for short intervals in the beginning of the lactation period can not be depended upon to indicate the normal percentage of fat produced by the cows tested."

Age as a factor in milk production, F. L. Kent (*Oreg. Countryman, 4 (1912), No. 9, pp. 18–20*).—Data are presented showing that the average yield of 5 cows at the Oregon Station and 10 cows at the Missouri Station was heaviest during the fourth lactation period.

Feeding experiments with dairy cows, C. I. Bray (*Oklahoma Sta. Rpts. 1910–11, pp. 30–36*).—On a ration of wheat bran, corn chop, alfalfa hay, and silage the cost of milk per gallon was 11.2 cts. When on a ration similar to the above, with the addition of cotton-seed meal, the cost of milk was 10.9 cts. per gallon, but the quantity was slightly decreased. In another test of the cost of milk production on a ration of bran, corn chop, cotton-seed meal, and alfalfa hay the cost was 11.7 cts. per gallon. On a similar ration, with silage as a supplement, the cost was 10.4 cts. per gallon and the yield was slightly increased.

Investigations on the effect of palm-nut cake on milk production, O. Kellner et al. (*Ber. Landw. Reichsamte Innern, 1911, No. 24, pp. XIII+343*).—This is the special report containing the complete details of the work previously noted (E. S. R., 26, p. 169).

The dairy farm from the view point of soil fertility, M. Kawashima (*Oreg. Countryman, 4 (1912), No. 9, pp. 31–35*).—Data are presented to illustrate the differences in amount of fertilizing elements removed from the dairy farm when the product is sold as whole milk, cream, cheese, or butter.

The bacterial content of the normal udder, F. C. Harrison and A. Savage (*Rev. Gén. Lait, 9 (1912), No. 6, pp. 121–131*).—These experiments were undertaken to ascertain the species of bacteria which normally occur in the bovine udder, their mode of entrance, and their action and hygienic importance.

Bacteria were isolated from the foremilk, middle milk, and strippings of heifers and mature cows. The bacterial content appeared to be small, and aside from the foremilk appeared to be practically limited to a few species of white and yellow cocci. *Micrococcus albidus* and *M. varians* were predominant in both virgin and mature udders.

The following conclusions are drawn: "Aside from the teat and cistern the flora of the normal udder is a small one and consists of a few species of cocci. The flora of the teat and cistern is subject to change which may be either practically continuous or slow. All organisms found in the lower part of the udder are unable to penetrate the upper and secreting regions. The flora of the fore-milk is not necessarily any indication as to what germs are located within the gland. All bacteria with which the teat openings come in daily contact are unable to effect an entrance. The lactic-acid bacillus is occasionally present in normal udders. The cocci that characterize the middle milk and strippings come from an internal source."

Bacteria in milk, L. A. ROGERS (*U. S. Dept. Agr., Farmers' Bul. 490, pp. 23, figs. 5*).—A revision of Farmers' Bulletin 348, previously noted (E. S. R., 20, p. 977).

The bacterium of contagious abortion of cattle demonstrated to occur in milk, A. D. MELVIN (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 198, pp. 3*).—The undescribed pathogenic bacterium found in milk, referred to in an article previously noted (E. S. R., 26, p. 87), has been found by means of the complement fixation test to be identical with the organism causing contagious abortion in cattle. Although not yet known to produce ill effects in man, the discovery furnishes an additional reason for pasteurizing milk. See also a note by Smith and Fabyan (E. S. R., 26, p. 586).

Experiments on the demarcation of Streptococcus acidi lactici from S. pyogenes and S. lanceolatus, Y. SAITO (*Arch. Hyg., 75 (1912), No. 3, pp. 121–133*).—Cocci grown on different media indicated that *S. acidi lactici* is so closely related to *S. lanceolatus* that it might be considered as the nonvirulent type of that species. On the other hand, there are a number of characters which distinguish it from *S. pyogenes*.

A bacteriological study of the milk supply of Washington, D. C., J. J. KINYOUN and L. V. DIETER (*Amer. Jour. Pub. Health, 2 (1912), No. 4, pp. 262–274, figs. 2*).—Thirty-five per cent of the raw milk and cream samples examined had a bacterial content under 500,000 per cubic centimeter, 20 per cent between 500,000 and 1,000,000, and 45 per cent over 1,000,000.

It is stated that the colon and streptococci content of milk can be taken with reasonable certainty as a measure of the dirt content and that the chief cause of the poor quality of milk lies in the careless handling of the milk before it leaves its place of origin. Although milk examined in October and November, 1910, showed a great number of bacteria, the colon bacilli and streptococci being present in large numbers in over 40 per cent of the samples, yet the average daily temperature was not high. Many of the samples of "commercially pasteurized" milk contained large numbers of bacteria.

"It is impossible to reconcile the fact that a so-called pasteurized milk containing as many as 38,000,000 bacteria per cubic centimeter, and 210,000 of these colon bacilli and 100,000 streptococci, is anything more than a dirty, bad milk."

Report of the commission on milk standards appointed by the New York milk committee (*Pub. Health and Mar. Hosp. Serv. U. S., Pub. Health Rpts., 27 (1912), No. 19, pp. 673–691*).—This contains data on chemical and bacteriological standards for milk and cream, methods of reporting bacteria and dirt content, municipal ordinances relating to the sale of milk and cream, and other matters pertaining to the improvement and regulation of the city milk supply.

Directions for the home pasteurization of milk, L. A. ROGERS (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 197, pp. 3, fig. 1*).—A revision of Circular 152, previously noted (E. S. R., 22, p. 179).

The resorption of lime in the animal body by the employment of pasteurized and sterilized milk, J. ZIMMER (*Ueber Kalkresorption im Tierkörper bei Verwendung von pasteurisierter und sterilisierter Milch. Inaug. Diss., Univ. Strassburg, 1911, pp. 12*).—In experiments with dogs, pasteurizing or sterilizing milk did not affect the percentage of calcium resorbed.

[Regulations concerning the use of preservatives in milk and cream], T. REECE (*Hoard's Dairyman, 43 (1912), No. 16, pp. 631, 632*).—This gives the regulations drafted by the British Local Government Board which will be enforced after June 1, 1912, and which prohibit the use of preservatives in milk and cream.

The sterilization of milk bottles with calcium hypochlorite, H. A. WHITTAKER and B. M. MOHLER (*Amer. Jour. Pub. Health, 2 (1912), No. 4, pp. 282–287*).—The bacterial count of bottles before treatment showed a wide range in the number of organisms. Counts on the total number of bottles examined from 8 sources showed a minimum count of 30, a maximum count of 1,600,000, and an average count of 120,000 per bottle. The counts on these same bottles after treatment with calcium hypochlorite showed a minimum count of 0, a maximum of 540, and an average of 45 per bottle. During the investigation the amount of hypochlorite required to produce efficient results was reduced from 20 to 10 parts of available chlorin per million, and the time of exposure from 1 hour to 20 minutes.

"The sterilizing of milk bottles by submerging in a solution of calcium hypochlorite appears to be a quick and inexpensive method of materially reducing the organisms present. It is not the intention of the writers to recommend this as a substitute for thorough steam sterilization but simply to be used as an expedient when the other method is impracticable."

Effects of alkali water on dairy products, C. LARSEN, W. WHITE, and D. E. BAILEY (*South Dakota Sta. Bul. 132, pp. 220–254*).—This experiment was undertaken to obtain data on the effect of water containing a large amount of mineral substances on milk and milk products.

Analyses are given of the mineral constituents in the water from 14 different wells. The water used in these experiments had a distinct saline, acrid, and sharp taste, but as far as could be determined it did not have any undesirable flavors due to decayed organic matter. It contained the highest percentage of total minerals, and also the greatest quantity of sulphates of any of the waters tested.

Although the experimental cows received 0.5 lb. more soluble minerals per day than the control animals, the percentage of total ash in the milk was not affected. The ash varied in composition, the sulphates and potash being the 2 chief ash constituents which showed an increase upon feeding alkali water, but this was not sufficient to affect the normal properties of the milk and milk products.

It is concluded that alkali water free from decayed organic matter and foreign odors does not taint the milk or butter. It is thought that the complaints made by some dairy farmers concerning the undesirable effect of alkali water on the flavor and properties of milk must be accounted for in some other way, probably by the decayed organic matter which is common in alkali water, as such water dissolves more organic matter than ordinary well water. This is especially true if the water contains much sodium carbonate, or what is commonly called "black alkali."

The coagulability of milk with rennet was not affected by the alkali water, but coagulability was found to bear a relation to the percentage of calcium in the milk and the individuality of the cow. The milk low in calcium required the

most rennet for curdling and produced the softest coagulum, and this milk was produced by cows well advanced in the gestation period.

The quality of salted butter washed in alkali water was unimpaired, but unsalted butter washed in alkali water was scored about 1 point lower in quality than butter washed in normal wash water. Although the alkali wash water contained a large number of nonacid types of bacteria, they were almost entirely supplanted by a large number of acid forms in the butter shortly after its manufacture. Acid tests confirmed the results of the judges who scored the butter that alkali water free from organic matter does not affect the quality of butter. Although there were more organisms in alkali water than in the soft water they decreased rapidly as the butter aged, and were no more deleterious to the quality of the butter than those found in ordinary well water.

Chemical analyses of cheese when 1 month old showed no differences from that made with ordinary soft water. Brine-soluble protein was low and insoluble protein high in freshly made cheese from milk produced by the cows receiving alkali water, but this difference diminished after the cheese had been cured 1 month.

The "coming of age" of the Babcock test, H. L. RUSSELL (*Wisconsin Sta. Circ. Inform. 32, pp. 3–18, figs. 7*).—A brief historical sketch of dairying in the United States since 1851, with special reference to the influence of the discovery of the Babcock test in putting the industry upon a more scientific basis.

On the composition of butter fat in butter of Danish and Russian Siberian origin, G. JÖRGENSEN (*Tidsskr. Landökonomi, 1911, No. 9, pp. 603–614*).—A summary of results of the examination of 11,690 samples of Danish butter and 2,374 samples of Siberian butter, made at Copenhagen from 1896 to 1910.

The index of refraction at 40° C. for the Danish butters ranged from 1.4525 to 1.4569, with an average of 1.4545. For the Siberian butter the range was 1.452 to 1.4574, and the average 1.4545. The amount of normal alkali required to neutralize 100 gm. of volatile fatty acid ranged from 47 to 71.9 cc., with an average of 59, in the Danish butter, and from 41 to 69.9 cc., with an average of 54 in Siberian butter. A high refraction number was invariably accompanied by a low figure for volatile acids and vice versa.

Department of dairy husbandry, R. C. POTTS (*Oklahoma Sta. Rpts. 1910–11, pp. 36–44*).—A financial statement of the operations of the college creamery for the fiscal year ended June 30, 1910, is reported. The number of patrons was 466, the average percentage of cream 35, average price paid per pound for milk fat 25.16 cts., pounds of butter made 242,466, percentage of overrun 18.64, average price received per pound for butter 26.928 cts., average cost of manufacturing a pound of butter 4.255 cts.

For the year ended June 30, 1911, the figures were as follows: Number of patrons 405, percentage of cream 33, price paid for milk fat 23.603 cts., pounds of butter made 160,105, percentage of overrun 16.7, average price received per pound for butter 24.5 cts., cost of manufacturing 1 lb. of butter 5.08 cts.

The dairy conditions on 100 farms were investigated, and total cash returns of 33 are presented in tabular form. In 7 of the herds the average net loss from 87 cows was $2.58 per cow per year, while in 8 herds the average net profit from 72 cows was $21.32 per cow.

Better butter for Kansas (*Kansas Sta. Circ. 24, pp. 4, figs. 8*).—This contains suggestions for keeping dirt and bacteria out of milk and cream.

Experiments with pure cultures for making Parmesan cheese, C. BESANA (*Bul. Agr. [Milan], 46 (1912), No. 7, p. 1; Molk. Ztg. [Hildesheim], 26 (1912), No. 31, pp. 555, 556*).—A report of a successful attempt in using pure cultures

for Parmesan cheese. Favorable results were obtained by placing the cheese mass in a specially constructed oven, and holding it there in a moist atmosphere at a temperature of from 40 to 45° C. for from 12 to 24 hours.

Studies on the bacterial flora of cheese, C. GORINI (*Ztschr. Gärungsphysiol., 1 (1912), No. 1, pp. 49–59, fig. 1*).—This has been previously noted from another source (E. S. R., 25, p. 582).

Factory arrangement, F. BALLANTYNE ET AL. (*N. Y. Produce Rev. and Amer. Cream., 33 (1912), No. 26, pp. 1106–1108, fig. 1*).—This contains a number of plans for arranging machinery and cooling facilities in creameries.

VETERINARY MEDICINE.

A text-book of ophthalmology for veterinarians, H. MÖLLER (*Lehrbuch der Augenheilkunde fur Tierärzte. Stuttgart, 1910, 4. rev. and enl. ed., pp. VIII+468, pls. 2, figs. 80*).—This is a fourth revised and enlarged edition.

Diagnostic methods, R. W. WEBSTER (*Philadelphia, 1912, 2. ed., rev. and enl., pp. XXXV+682, pls. 37, figs. 164*).—This is the second edition of this well-known work, which deals with chemical, bacteriological, and microscopical methods. The new material includes the antiformin method for tubercle bacilli; the Much method for staining tubercle bacilli; the Neubauer and Fischer test for gastric carcinoma; the Gross method for trypsin; Folin's newer methods for urinary sulphur compounds; the formalin method for ammonia in urine; Benedict's and Bang's tests for glucose in urine; the phenolsulphonephthalein test for functional activity of the kidneys; the Wright and Kinnicutt method of counting the blood plates; sulphemoglobinemia; and the tuberculin and luetin reactions. The sections dealing with bacteriology of the blood and with serum pathology have been greatly enlarged.

A study of Ascoli's reaction (thermoprecipitin) for the diagnosis of anthrax, P. SILVA (*Rev. Gén. Méd. Vét., 19 (1912), No. 225, pp. 503–505*).—This reaction can be employed for detecting sausage and other meat products prepared from animals affected with anthrax.

The use of Ascoli's diagnostic method in practice, K. PRESSLER (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 11, pp. 192, 193*).—This is a report on an authentic case of anthrax in which Ascoli's method gave negative results, due to the low titer of the serum employed. The author considers the method a good one, but points out that the serum employed should always be tested with filtered (bisque) blood obtained from animals having anthrax. Other improvements are also suggested.

Dourine, its pathogenicity, and a practical test of the efficacy of drug treatment, with especial reference to the action of atoxyl and arsenophenylglycin, A. WATSON (*Jour. Compar. Path. and Ther., 25 (1912), No. 1, pp. 39–45*).—This is a reprint from the report previously noted (E. S. R., 26, p. 881).

Is foot-and-mouth disease disseminated by milk-collecting stations? (*Molk. Ztg. [Hildesheim], 25 (1911), No. 52, pp. 981, 982*).—It is not believed that milk-collecting stations have any great part in the dissemination of the virus.

Recent methods for the diagnosis of glanders, F. B. HADLEY (*Amer. Vet. Rev., 41 (1912), No. 2, pp. 152–157*).—For ordinary clinical use the agglutination test was found to be the most desirable, particularly for cases of recent infection. In this work the greatest number of horses examined gave a reaction with the 1:200 dilution, others with the 1:500 dilution, and only two with the 1:800 dilution. It is pointed out that variations in the agglutinating power of the blood may occur within narrow limits in the healthy horse, but if these variations are very marked the animal must be considered with suspicion. All the

horses tested which gave a reaction in the 1:1,000 dilution were proved to be glandered by other tests. Animals reacting in such high dilution are diseased and should be immediately quarantined or destroyed. Satisfactory results could not be obtained with the Konew method (E. S. R., 24, p. 184).

Glanders and combating glanders in Kurland, L. Geronimus (*Arch. Vet. Nauk [St. Petersb.], 41 (1911), No. 12, pp. 1542–1565; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 5 (1912), No. 5, p. 1003*).—In 1910 the government of Kurland had 172 cases of glanders at 49 locations. Of these animals 168 were killed and 4 died. Comparative tests made for the purpose of determining the value of anaphylaxis tests show that the subcutaneous mallein test and the conjunctival test gave approximately parallel results.

In regard to the phagocytic action of various sera upon some of the bacteria occuring in hemorrhagic septicemia, R. Broll and St. Angeloff (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 4 (1908), No. 5–6, pp. 469–475; abs. in Berlin. Tierärztl. Wchnschr., 27 (1911), No. 34, p. 612*).—The opsonic power of various sera was tested against swine plague, fowl cholera, game and bovine plague, and septic calf pneumonia bacteria.

It was noted as a result of the tests that the polyvalent swine plague serum possesses an opsonic power but not a bacteriolytic or bactericidal power. The swine plague bacterium (*Bacterium suisepticus*) is also influenced opsonically to a slight degree by normal horse, bovine, and hog sera. The polyvalent swine plague serum, on the other hand, has a strong opsonic power which is still present in a dilution of 1:50. In addition to the *B. suisepticus*, the fowl cholera bacterium was affected by the swine plague serum, although to a lesser extent. The opsonic action of the polyvalent serum upon the game and bovine plague bacterium was found to be very weak, whereas the calf pneumonia serum behaved as would a normal serum.

It was further noted that the opsonins were heat labile. Heating the polyvalent serum for ½ hour at 60° C. (inactivated) was sufficient to cause a considerable reduction in the opsonic power.

An extensive epizootic of rabies, A. Carini (*Ann. Inst. Pasteur, 25 (1911), No. 11, pp. 843–846; abs. in Jour. Amer. Med. Assoc., 58 (1912), No. 2, p. 149*).—The author reports an extensive epizootic of rabies in cattle and horses in Brazil, which caused the death of some 4,000 cattle and 1,000 horses.

"There was no unusual prevalence of rabies in dogs at the time, but it was noticed that bats in broad daylight attacked and bit the cattle, and the author suggests that bats may have been the source of the extensive epizootic. It has been prevailing for several years but exclusively in a narrow strip of the country. As its true nature was not discovered until recently, prophylaxis has not been on the correct basis. The animals affected all die after a few days, and the meat and hides have been utilized but no mishaps have been known to follow."

Studies in regard to tuberculosis, A. Fontes (*Mem. Inst. Oswaldo Cruz, 3 (1911), No. 2, pp. 196–217, pls. 7*).—Thinking that some of the results obtained in previous work (E. S. R., 25, p. 184) might be due to the presence of enzyms such as zymase, protease, and oxidase, the author made tests with filtrates which contained the granula obtained from the cultures of tubercle bacilli.

Although negative results were obtained in the enzym tests, a substance capable of dissolving or saponifying fats was noted in the juice obtained from caseated and ruptured lymphatic glands. The granular forms of the tubercle bacillus were produced by injecting extracts from the diseased lymphatic glands and the human type of bacillus into the abdominal cavity of guinea pigs. Granula were noted in the lymphatic glands of the experimental animals,

but in no instance was the regular acid-fast tubercle bacillus detected. Most of the experimental animals had a generalized tuberculosis. The extracts of casefied foci contained a specific substance which was antagonistic to the tubercle bacillus, and which according to the author does not originate from the bacillus. The use of iodin preparations in tuberculosis increased the process of congestion.

Tuberculosis (*Illinois Sta. Circ. 158, pp. 3–21, figs. 13*).—This is a republication of the compilation previously noted (E. S. R., 26, p. 378).

In regard to the chemical composition of the tubercle bacillus, T. PANZER (*Hoppe-Seyler's Ztschr. Physiol. Chem., 78 (1912), No. 5, pp. 414–419*).—The author points out that the published analyses of the tubercle bacillus do not give any clue in regard to the principal constituents of this organism.

Tubercle bacilli which were cultivated on glycerin bouillon were killed by heat, collected on a filter, washed with water, and dried in a vacuum over calcium chlorid. The weight of dried bacilli obtained was 2.7 gm. They were then rubbed up and extracted successively with ether, alcohol, cold water, 1/20-normal hydrochloric acid, 1/20-normal sodium carbonate, 1/20-normal sodium hydrate, hot water, and 2 per cent potassium hydrate.

The cold water, hydrochloric acid, sodium carbonate, sodium hydrate, and potassium hydrate extracted very little material. The unsaponifiable material contained in the ether extract of the bacilli, precipitated with digitonin and extracted with petroleum ether and xylol, yielded a mixture of colorless crystals and a yellow, smeary mass which did not give the cholesterol reaction. According to the author two higher alcohols are probably present. The alcoholic solution obtained reduced Fehling's solution and on evaporation yielded a brown, partly crystalline residue.

The hot water extract of the bacilli on evaporation left a residue which reminded one of gum arabic. This substance was free from sulphur, nitrogen, and phosphorus, gave Molisch's reaction with α-naphthol, was precipitated from the aqueous solution with alcohol or lead acetate, and after boiling for a time with hydrochloric acid reduced Fehling's solution. On oxidizing with nitric acid no mucic acid was produced, the chief product being oxalic acid. In addition a crystalline substance resembling calcium saccharate was also obtained. This substance is probably pectin.

The residue remaining after extraction of the above reagents and containing nitrogen gave Molisch's reaction, and after boiling with hydrocloric acid reduced Fehling's solution. The filtrate obtained from treating another portion of the residue with pepsin did not give a biuret reaction, although the solid particles remaining did. This resistant body is evidently chitin.

Tuberculosis of the abomasus of bovines, P. CHAUSSÉ (*Bul. Soc. Cent. Méd. Vét., 88 (1911), No. 20, pp. 452–476, figs. 12*).—A discussion in regard to the macroscopical and miscroscopical findings and the pathology of this condition. The article contains profuse illustrations of pathological preparations.

The ophthalmic test for bovine tuberculosis, A. WILSON (*Jour. Compar. Path. and Ther., 24 (1911), Nos. 1, pp. 59–66; 2, pp. 116–126*).—This is a critical study of the opthalmic and subcutaneous tests for detecting tuberculosis. Considerable stress is laid upon the unreliability of diagnosing tuberculosis on the basis of the simple ophthalmic test alone. Satisfactory results can only be obtained when both tests are conducted together.

Utilizing the work of our international commission on the control of bovine tuberculosis, M. H. REYNOLDS (*Amer. Vet. Rev., 41 (1912), No. 2, pp. 196–200*).—In this paper the author points out the services rendered by agricultural colleges, farmers' institutes, state live-stock sanitary boards, etc., in combating tuberculosis.

In regard to the type of tubercle bacilli which is present in tuberculosis of swine, H. E. KERSTEN and E. UNGERMANN (*Tuberkulose Arb. K. Gsndhtsamt., 1912, No. 11, pp. 171–199*).—From 19 tuberculous swine pure cultures of the bovine type of bacillus were obtained and tested as regards virulence with guinea pigs. Seventeen of the cases were taken at random in the slaughterhouses while the 2 remaining ones were suspected of being of human origin. One of the latter cases on autopsy seemed to have its inception as a result of castration.

Infectious abortion in bovines, MIESSNER (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 18, pp. 316, 317*).—After investigating the value of the serodiagnostic methods with cattle in the eastern provinces of Germany, the author finds that the agglutination and complement fixation methods, in the form in which they have been used for diagnosing glanders, are a reliable means for diagnosing infectious abortion in bovines. In practically all cases the serum test substantiated the clinical findings. Infectious abortion was found to have no relation to vaginal catarrh. The author will publish a more detailed report of this work later.

A comparative investigation in regard to milk from cows having infections of the udder, E. SEEL (*Ztschr. Untersuch. Nahr. u. Genussmtl., 21 (1911), No. 3, pp. 129–168; abs. in Ztschr. Angew. Chem., 24 (1911), No. 12, p. 561*).—From the results it could be noted that the reaction of the secretion from animals suffering from mastitis is alkaline toward litmus. The milk sugar, fat, and chlorids are much diminished, while the protein, particularly albumin, is increased. The refraction of fats showed considerable variation from the normal.

Abnormal milk from cows affected with an inflammation of the mammary glands, C. AMBERGER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 23 (1912), No. 8, pp. 369–379*).—A description of the chemical changes taking place in the milk from 2 animals during the cycle of the disease. The most pronounced changes were the same as those noted in the abstract above with the exception that the chlorin content was increased. One of the samples showed at the outset an increased fat content.

Investigation of milk from cows suffering from mastitis for its enzym content, H. ULMANN (*Untersuchungen von Milch euterkranker Kühe auf ihren Enzymgehalt. Inaug. Diss., Tierärztl. Hochsch. Stuttgart, 1912, pp. 78; rev. in Deut. Schlacht u. Viehhof Ztg., 12 (1912), No. 21, pp. 319, 320*).—The enzym content of milk was found to be influenced by the presence of mastitis, which in most instances had a tendency to increase it. It, however, undergoes marked fluctuations and is greatly dependent upon the nature of the changes which have taken place in the secretion. The catalase content is almost always increased in both the mixed milk and the milk obtained from the inflamed quarter. Such milk is usually alkaline. The reductase reaction (Schardinger's enzym) in the first stages of mastitis is present in either a normal or an increased amount, so it is, therefore, without value for detecting mastitic animals. Oxidase, peroxidase, and diastase tests are also of no value for this purpose.

Contagious vaginitis in cows, P. STAZZI (*Vet. Jour., 68 (1912), No. 440, pp. 83–88*).—The following measures are recommended by the author, who was commissioned by the Italian minister of the interior to investigate and report on this disease, which is of great importance in Italy as well as elsewhere.

"Provide open pasturage for all cows, especially for those whose conception is tardy. Wash frequently the flanks, tails, and feet of cattle with soap and soda. Cleanse and disinfect weekly with boiling soapsuds or lime wash all stalls, harness, etc. Disinfect the genital organs of bulls before and after

coitus (2 per cent solution of lysoform recommended). Treat heifers till cured according to veterinary advice, suspending the treatment during œstrum. Douche with 2 per cent solution of carbonate of soda during œstrum, especially immediately before covering. After the seventh month of pregnancy use only the mildest of medicaments, such as ointments containing a very little belladonna and only 0.5 per cent of a nonirritant antiseptic, lysoform, etc. Isolate or slaughter cows suffering from chronic metritis and those in whom œstrum has entirely ceased. After parturition inject weak solutions of iodin—a teaspoonful in each quart of tepid water."

The treatment of contagious vaginitis in cattle, E. WALTER and A. GÄRTNER (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 8, pp. 133–140; abs. in Jour. Compar. Path. and Ther., 25 (1912), No. 1, pp. 74–82*).—In attempting to discover a disinfectant which might be kept in constant contact with the mucous membrane and one which is at the same time simple of application, the authors have made successful use of a eucerin salve. In preparing this ointment the anhydric eucerin is gradually worked up in a mortar with the desired quantity of a watery solution of the medicament until the mixture is quite uniform. The complete absorption of the water is indicated by the clinging of the mixture to the sides of the mortar.

In the experiments here reported eucerin ointments containing 10 per cent bacillol, 0.5 per cent sublamin, and 25 per cent water; 10 per cent sapoformol, 0.5 per cent sublamin, and 25 per cent water; 8 per cent bacillol, 0.6 per cent sublamin, and 25 per cent water; 3.5 per cent copper sulphate and 25 per cent water; 10 per cent copper sulphate and 25 per cent water; 10 per cent copper citrate and 25 per cent water; 8 per cent bacillol, 0.6 per cent sublamin, and 25 per cent water; 8 per cent bacillol, 0.5 per cent sublamin, and 25 per cent water; and 8 per cent bacillol and 25 per cent water, respectively, were employed.

From the results obtained it may be concluded that animals affected with vaginitis can be cured in this way. "The results are the same whether the cases are recent or of long standing, and also if other methods of treatment have been tried. This result is obtained by the application of a disinfectant which is present in the same proportion in a number of other materials that are in common use for the treatment of this disease. Since these preparations are by no means so successful, the authors concluded that the difference must lie in the vehicle in which the disinfectant was suspended. . . .

"It is absolutely necessary that the eucerin mixture be applied to the whole of the diseased membrane. . . . Relapses ceased to occur when the salve was distributed throughout the vagina by means of a special instrument—cunnfricator. The even and thorough distribution of the salve over the mucous membrane by means of this instrument was controlled by the examination of 3 animals that were slaughtered. Ten gm. of the mixture were smeared over the walls of the vagina by its means shortly before death, and after slaughter it was found that the entire mucous membrane was covered with a layer about 1 mm. thick. In practically all the experimental animals application of the bacillol mixture caused the disappearance of the nodules within 4 to 5 days, and it was only in quite exceptional cases that traces of the lesions were visible on the fifth day. In cases where the treatment was continued for longer periods it was done with the idea of preventing relapses with greater certainty and not to improve the local curative effect. The treatment was quite simple and was not followed by any untoward symptoms, such as restlessness and straining. The nature of the treatment with the soft, semifluid salve is such that animals in the last stages of pregnancy may be submitted to it without hesitation. . . .

"Since no immunity is conferred by this method of treatment steps must be taken, by resorting to disinfection, to prevent the persistence of the cause of the disease on the bodies of the animals and in the stalls. For this reason 2 disinfections were practiced in the later experiments; the hindquarters of the perineal regions of the animals were washed with either 5 per cent bacillol or 5 per cent sapoformol, and the stalls were subjected to a thorough cleansing, followed by a disinfection with lime wash. In order to prevent the introduction of fresh infection through the agency of the bull, this animal was also subjected to treatment. About 10 gm. of eucerin mixture were introduced into the sheath and distributed by massage. As in the case of cows this treatment was carried out on 10 occasions, 5 on consecutive days and 5 on every second day."

Nodular intestinal disease of cattle, W. JOWETT (*Jour. Compar. Path. and Ther., 25 (1912), No. 1, pp. 15–22, figs. 5*).—The author thinks the species *Œsophagostomum biramosum* the cause of the nodular disease of cattle in the Cape Peninsula, South Africa. See also a previous note (E. S. R., 26, p. 382).

A contribution to the illustration of the injury caused by the ox warble and the manner of combating it, H. J. DE VRIES (*Ein Beitrag zur Illustration des durch die Dasselfliege verursachten Schadens, und die Bekämpfung derselben beim Rindvieh. Inaug. Diss., Univ. Bern, 1910, pp. 63, pls. 5*).—In the first part of this work the author briefly reviews the history of the biological study of the ox warble (*Hypoderma bovis*). Observations of the larva in the esophagus, vertebral canal, and subcutis are then reported. Discussions of the effect of the wandering of the larvæ upon the tissues, the amount of inquiry caused as based upon the decrease in milk, flesh, and value of the hide, and methods of combating it, especially as applied to the Netherlands, follow.

Several plates are included which illustrate the life history of the insect in its various stages, injury caused to the hide, etc.

A campaign against the ox warble, V. DROUIN (*Rev. Gén. Méd. Vét., 19 (1912), No. 226, pp. 557–571, pls. 2, figs. 3*).—A summarized account of the ox warble, its economic importance, biology, prophylaxis, etc.

Bacillus enteritidis Gärtner in the carcasses of eight calves, H. WINZER (*Ztschr. Fleisch u. Milchhyg., 22 (1911), No. 3, pp. 81–84; abs. in Jour. Compar. Path. and Ther., 25 (1912), No. 1, pp. 57–59*).—"The author's experience in connection with the occurrence of organisms of this group in meat is at variance with the scanty published references, in that within 4 months he has been able to isolate from the carcasses of 8 calves organisms which on morphological, cultural, and serological grounds undoubtedly belong to the Gärtner group."

Melanosis in calves, A. JAEGER (*Berlin. Tierärztl. Wchnschr., 27 (1911), No. 44, pp. 793–798*).—A contribution in regard to the relation of melanosis to cancer.

On the treatment of contagious pneumonia (Brustseuche) of the horse with Salvarsan, NEVERMANN (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 7, pp. 119–125; abs. in Jour. Compar. Path. and Ther., 25 (1912), No. 1, pp. 63, 64*).—"Sixty-five stallions were treated with Salvarsan, and of these 55 were free from fever within 5 days, at the longest, after a single injection of 3 gm. The other 10 animals received a second dose of 2 gm. on the fifth day of the disease, and the temperature of these was normal on the eighth day from the onset of symptoms. No untoward symptoms followed the injection of Salvarsan, and it was very striking how quickly the animals treated with the drug recovered."

Agglutination reactions during the process of hog cholera serum production, W. GILTNER (*Centbl. Bakt. [etc.], 1. Abt., Orig., 60 (1911), No. 6, pp.*

552–579; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 5 (1911), No. 4, pp. 961, 962).—Previously noted from another source (E. S. R., 26, p. 785).

In regard to immunizing against hog cholera and swine plague, H. Preisz (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 11 (1912), No. 2, pp. 125–152; abs. in Berlin. Tierärztl. Wchnschr., 28 (1912), No. 17, p. 299*).—After making an examination of a number of cases of swine plague in young pigs the author concludes that the work of Löffler and Schütz does not determine the etiology of this disease. For combating it, he recommends extreme hygienic measures, protective vaccination occupying only a secondary place.

The etiology of hog cholera seems to have been worked out. In this disease protective vaccination is of great importance. The protective and curative action is the best when a composite serum is employed.

Combating swine plague by vaccinating pregnant hogs, F. Train (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 3, pp. 45, 46*).—By vaccinating 17 pregnant hogs in infected stalls with polyvalent swine plague bacilliary extracts, pigs were obtained free from the disease and went on so to maturity. Antiseptin was used for 23 other animals. Of these 22 gave birth to sound litters and 3 others yielded pigs with exanthema, but without a cough. Three additional animals which received antiseptin and antiserum simultaneously yielded sound offspring.

The results obtained by other workers with these preparations are included.

On the chemistry and toxicology of ascarids, F. Flury (*Arch. Expt. Path. u. Pharmakol., 67 (1912), No. 4–5, pp. 275–392*).—The first part of this work (pp. 275–338) deals with the chemistry, the second part (pp. 339–392), with the toxicology of ascarids.

RURAL ENGINEERING.

Fundamental principles in tile drainage, J. L. Parsons (*Proc. Iowa Engin. Soc., 23 (1911), pp. 30–38*).—This is a paper read before the Iowa Engineering Society, held at Des Moines, February 15–17, 1911.

The essential features in planning a tile drainage system are pointed out and discussed, among them the planning of grade lines, determining the sizes of tile, and laying out and spacing laterals.

The reclamation of Missouri lowlands for agricultural purposes, F. F. Shafer (*Colman's Rural World, 65 (1912), Nos. 17, p. 1; 18, p. 1; 19, p. 1*).—The author briefly discusses some of the principal factors that should guide an engineer in making plans for drainage improvement districts, among which are climate, rainfall, topography, watershed, vegetation, and soil characteristics, and describes tile drainage and its benefits.

Results of experiments made to determine the waste of water by cultivators in irrigating their fields during the 3 years 1907–10, W. B. Gordon (*Punjab Irrig. Branch Papers, No. 11, pt. 2 B, pp. 5*).—The results of these experiments show that the average cultivator in the Punjab in applying the water to his fields wastes on an average at least 20 per cent of it. Dividing the fields into compartments and insisting upon the water being delivered separately into each compartment are advocated.

[Problems relative to irrigation of fields], J. M. Pujador (*Rev. Inst. Agr. Catalán San Isidro, 61 (1912), No. 7, pp. 99–102, figs. 3*).—Systems of field irrigation are described, consisting essentially of motor-driven pressure pumps, pipe or hose systems for conveying the water, and apparatus for sprinkling and distributing the water over the fields.

A kerosene motor for irrigation, R. Olney (*Irrig. Age, 27 (1912), No. 6, p. 218, figs. 2*).—Attention is called to the use of kerosene motors for driving

irrigation pumps and a table of test results is given showing the total cost of fuel per brake horsepower, for a season of 80 days, of steam and gasoline as compared to kerosene. Data derived from the operation of 3 types of steam engine, 1 type of gasoline engine, and 1 type of kerosene engine, ranging from 30 to 100 horsepower, show that the cost of fuel for the kerosene engines was approximately one-half that for the gasoline engines, and approximately two-thirds that for the steam engines.

Irrigation laws of the State of Nebraska in force July 7, 1911, D. D. PRICE (*Lincoln, Nebr.: Bd. Irrig., Highways, and Drainage, 1911, pp. 72*).—A compilation.

Triennial revenue report of the public works department, irrigation branch, Bengal, for the 3 years ending 1910–11, T. BUTLER (*Trien. Rev. Rpt. Pub. Works Dept., Irrig. Branch, Bengal, 1910–11, pp. III+104, pls. 16*).—This report gives tabulated statements showing the areas irrigated, the capital outlay, and financial results of the canals in Bengal, diagrams illustrating the same, and tables of rainfall data, water duty data, crop experiments, and values.

Fifteenth biennial report of the state engineer of Colorado, C. W. COMSTOCK (*Bien. Rpt. State Engin. Colo., 15 (1909–10), pp. 341, pls. 14*).—This report covers the existing physical and financial status of water supply and irrigation, road, and bridge works in Colorado in 1909–10, and includes the reports of division irrigation engineers, tabulated data from the reports of water commissioners, and a preliminary hydrographic report of the Yampa Basin. A large amount of tabulated discharge data from hydrographic investigations of the principal rivers of the State is presented.

First biennial report of the State Road Commission of Utah, 1909–10 (*Bien. Rpt. State Road Com. Utah, 1 (1909–10), pp. 70, pls. 21, figs. 4*).—This report, embodying reports of the 4 state road commissioners, states the progress of road improvement and construction in Utah in 1909–10, discusses the methods in use, gives a detailed account of the cost in each county, and makes recommendations for modifying the road statutes of the State relative to methods of improvement, construction, and administration.

The combined reports of all counties show that during 1909–10, 125.424 miles of road have been graded, surfaced with gravel or stone, or reconstructed of sand clay at a total cost of $100,631.

Preliminary report on the road materials and road conditions of Oklahoma, L. C. SNIDER (*Okla. Geol. Survey Bul. 8, 1911, pp. XIII+191, pls. 12, figs. 26*).—This bulletin describes the meteorology, geography, and rock formations of Oklahoma, the general conditions and road laws, the distribution of road materials throughout the State, and the physical and chemical properties of road materials, and discusses the financial and social advantages of good roads in the different localities.

The construction and maintenance of earth and sand-clay roads are discussed under the subheads of location, surface and underdrainage, bridges and culverts, and machinery used. Paved roads are discussed under the subheads of macadam, brick, stone-block, and bitumens. The distribution of road materials is given by counties, and their distribution and the road conditions are discussed by dividing the State into 3 districts, the eastern district, the western district, and the southern or cretaceous district. The road materials of the State are classified in general as sand, clay, gravel, bitumens, coal-mine clinkers, igneous, sedimentary, and metamorphic rocks.

Use of bitumens for roads, A. H. BLANCHARD (*Municipal Jour., 32 (1912), No. 20, pp. 750–753*).—This is a paper read before the American Association for the Advancement of Science. A review is given of the use of bituminous mate-

rials in the construction and maintenance of American highways during 1911, discussing the extent of use, surface treatment, the penetration method, and bituminous concrete.

Construction of country roads (*Missouri Bd. Agr. Mo. Bul., 10 (1912), No. 3, pp. 78, figs. 55*).—This bulletin discusses road contracts, costs of plans, surveys, etc., the construction and cost of earth, sand, sand-clay, chert, rock and gravel, bituminous, concrete, and brick roads, and the methods and cost of maintenance.

General forms for specifications and contracts, roads and culverts, 1912 (*Missouri Bd. Agr. Mo. Bul., 9 (1911), No. 10, pp. 38*).—This pamphlet contains suggested forms and other data for specifications and contracts relating to highway work.

Electric power on the farm, A. SHANE (*Iowa State Col. Engin. Expt. Sta. Bul., 10 (1911), No. 1, pp. 63, figs. 36; abs. in Gas Engine, 14 (1912), No. 5, pp. 244–246, figs. 2*).—It is the purpose of this bulletin to outline an electric system of general application to the farm and to discuss in some detail a particular installation under certain assumed farm conditions.

It is stated that on an average sized farm without the advantages of water power or a nearby transmission line, a gasoline engine offers the most advantages for driving the generator, chief of which are the little attention required and the fuel economy. Some electrical facts are stated, a few general instructions are given relative to installation, wiring, daily operation, ordering and testing apparatus, and computing operating costs. The general advantages of electric power on the farm are pointed out, such as flexibility in application to farm buildings, the independence of the farmer to outside help and weather conditions, and safety, easy care, easy control, and economy of electric machinery. The estimated cost of a power plant consisting of a 10-horsepower gasoline engine, 6 kilowatt generator, switchboard, and a 50-cell storage battery with accessories is $1,017, and of the entire installation, including house, outbuilding, and outside apparatus is $1,486.50.

Experiments on the application of electricity to agriculture (*Jour. Soc. Agr. Brabant et Hainaut, 57 (1912), No. 18, pp. 203, 204*).—Results of investigations are given showing the electric power required for driving different agricultural machines.

A review of investigations of the international congress on the application of electrical energy, P. LECLER (*Bul. Soc. Agr. France, 1912, May 1, pp. 445–456*).—The production, transmission, and utilization of electrical energy are dealt with, the bulletin discussing more especially the use of electricity in agriculture for electroculture and driving farm machinery, from both the technical and economic points of view.

A novel and efficient farm power plant, E. S. ESTEL (*Kimball's Dairy Farmer, 10 (1912), No. 8, p. 275, figs. 2*).—The author describes a farm waterpower plant, consisting essentially of a small concrete pressure dam, having an 8-ft. head, a 9-ft. overshot water wheel, a small power house, transmission line, and house and outbuilding installations of motors, lights, etc. The total cost is given as a little less than $400.

Use of dynamite on the farm (*Philadelphia, 1911, pp. 112, figs. 53*).—This pamphlet gives a large amount of data dealing with the use of dynamite on the farm, including directions for the use of this explosive in land clearing, digging drainage ditches, road grading, excavating for foundations, cellars, walls, post holes, etc., subsoiling and plowing, orchard cultivation, and for breaking up ice gorges, log jams, and log rollways.

The hydraulic ram, W. C. DAVIDSON (*Missouri Bd. Agr. Mo. Bul., 10 (1912), No. 2, pp. 36, figs. 19*).—This bulletin deals with the use of the hydraulic ram on the farm, describing the complete equipment and the theory of operation of

the hydraulic ram, stating the local conditions requisite, giving the necessary directions for installing a hydraulic ram, and discussing methods for computing the capacity of a hydraulic ram and the flow of streams or springs supplying the water. In addition considerable specific information is given regarding types of hydraulic rams, special installations, and methods of installing plants to satisfy individual conditions.

A novel automobile for soil cultivation, P. Éverard (*Ann. Gembloux, 22 (1912), No. 5, pp. 309–312, figs. 2*).—A motor-driven machine for soil cultivation is described, consisting of a frame supporting a motor, a pair of adjustable rollers, which operates a double set of traveling plow shovels, and a pair of cutting discs in front of the shovels. The motor is connected to the other apparatus by a chain drive and can be disconnected and used for driving other farm machinery or for transportation.

New spring-shovel cultivator (*Wiener Landw. Ztg., 62 (1912), No. 27, p. 338, figs. 9*).—A cultivator is described which has spring beams for its shovels as a protection against breaking the beam by striking roots, stones, etc.

The binder engine, E. B. Sawyer (*Nebr. Farmer, 44 (1912), No. 18, p. 503, fig. 1*).—Attention is called to the use of a light weight all-purpose engine for driving the mechanism of a binder. This engine is attached to the rear of the machine with brackets and operates the whole mechanism of the binder by means of a special drive chain connection. The drive wheel of the binder can be disconnected and this results in a great saving of horses.

Land dragging in good cultivation, J. Jensen (*Masch. Ztg., 10 (1912), No. 8, pp. 92–94, fig. 1*).—The need of dragging the fields during the spring ground breaking, thereby smoothing the ridges and breaking the clods, is pointed out, and a drag is described which is suitable for a road drag, land drag, or manure spreader. This drag is constructed of 2 wooden beams about 5 ft. apart connected by an iron rod framework to each of which is attached an iron band drag blade.

Test of a grain cleaning and sorting machine, J. Rezek (*Mitt. Landw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien, 1 (1912), No. 1, pp. 115–129, table 1, pl. 1, fig. 1*).—This article gives a description of the operation and mechanical details of a machine for the cleaning, drying, and sorting of grain, and gives the methods and a table of results of tests. The grain is cleaned and dried by fan action and is separated into 3 different weights by the centrifugal action of a revolving drum. A mathematical discussion of the centrifugal action on the different weights of the grain is given, and with it a section of the centrifugal drum and plans showing the details and dimensions of the machinery in general.

The mechanical harvesting of cotton, F. Main (*Jour. Agr. Trop., 12 (1912), No. 129, pp. 75–78*).—A machine is described for the mechanical picking of cotton, consisting of a frame set on 4 wheels, supporting a 30-horsepower engine, which drives the picking machinery and is directly connected to the hind drive wheels. The cotton is picked by the action of steel teeth and fingers and is conveyed to sacks in the rear. It is claimed that from 8 to 10 acres of cotton can be picked in a day.

Report of tests on a dairy refrigerator, B. Martiny (*Molk. Ztg. Berlin, 22 (1912), No. 16, pp. 181–183, figs. 3*).—This article describes and gives the results and conclusions of tests of a device intended for the quick cooling of fresh milk and cream. This device consists of a chest containing an ice box with sloping bottom, above which is a receiving basin for the milk and cream. This communicates with a drip or sieve basin from which the milk or cream runs down along the bottom side of the sloping ice chest in a thin stream. It is quickly cooled in its descent and is caught in a reservoir below.

The results of tests lasting 3 days show the weights of ice and salt and the time required to cool given quantities of milk and cream. The advantages of the device pointed out are that it is self-acting, its capacity is such that a considerable quantity of milk and cream can be cooled and stored for some time, it is simple in construction and operation, and its initial cost and cost of operation are relatively small.

RURAL ECONOMICS.

Farms and farm property [in the United States] (*Bur. of the Census [U. S.] Bul. 13, pp. 20, figs. 3*).—This bulletin presents in final form the principal data pertaining to farms and farm property in the United States by States and geographic divisions for 1900 and 1910, and by geographic divisions for each census from 1850 to 1910, correcting and supplementing preliminary data (E. S. R., 25, p. 893).

The following table summarizes for the United States the principal facts regarding population, farms, and farm property for the years 1910 and 1900:

Farms, farm land, and farm property of the United States.

	1910 (April 15).	1900 (June 1).	Increase.	
			Amount.	Per cent.
Population	91,972,266	75,994,575	15,977,691	21.0
Urban population	42,623,383	31,609,645	11,013,738	34.8
Rural population	49,348,883	44,384,930	4,963,953	11.2
Number of all farms	6,361,502	5,737,372	624,130	10.9
Land area of the country, acres	1,903,289,600	1,903,461,760	−172,160	.....
Land in farms, do	878,798,325	838,591,774	40,206,551	4.8
Improved land in farms, do	478,451,750	414,498,487	63,953,263	15.4
Average acreage per farm	138.1	146.2	−8.1	−5.5
Average improved acreage per farm	75.2	72.2	3.0	4.2
Per cent of total land area in farms	46.2	44.1	.....	.....
Per cent of land in farms improved	54.4	49.4	.....	.....
Per cent of total land area improved	25.1	21.8	.....	.....
Value of farm property, total	$40,991,449,090	$20,439,901,164	$20,551,547,926	100.5
Land	28,475,674,169	13,058,007,995	15,417,666,174	118.1
Buildings	6,325,451,528	3,556,639,496	2,768,812,032	77.8
Implements and machinery	1,265,149,783	749,775,970	515,373,813	68.7
Domestic animals, poultry, and bees	4,925,173,610	3,075,477,703	1,849,695,907	60.1
Average value of all property per farm	$6,444	$3,563	$2,881	80.9
Average value of all property per acre of land in farms	46.64	24.37	22.27	91.4
Average value of land per acre	32.40	15.57	16.83	108.1

Increase in value of farm lands (*Conn. Farmer, 42 (1912), No. 16, p. 4*).—This article directs attention to the constant increase of land values in New England, attributing it to the increased demand for land from people who have lived in the West and are now seeking cheaper lands nearer better markets in the East.

Making the farm renter a farm owner, G. H. Cushing (*Nat. Land and Irrig. Jour., 5 (1912), No. 5, pp. 1–6, figs. 6*).—It is noted in this article that the directors of the Canadian Pacific Railway Company have recently appropriated $500,000 as an initial fund to be loaned to renters for the purpose of buying and settling lands in the Provinces of western Canada. The conditions incident to any loan are (1) that the applicant is married, (2) must have demonstrated his ability to operate a farm successfully, (3) must have enough money to pay one-tenth the purchase price of the farm and maintain his family for a year,

and (4) must personally inspect and select the land he buys. If he can meet these requirements the company will loan him as much as $2,500 at 6 per cent interest for a period of 10 years.

The condition of the agricultural workmen in Sweden (*Internat. Inst. Agr. [Rome], Bul. Bur. Econ. and Soc. Intel., 3 (1912), No. 2, pp. 207–222*).—This article notes that during the last quarter of the eighteenth century, the peasants formed on an average 63.4 per cent of the agricultural population in Sweden; the "base tenants," that is tenant farmers whose rent consists in a fixed number of days' labor for the proprietor, 12.1 per cent; the "backstugusittare" (occupiers of the smallest lots of land who are not bound to a fixed number of days' labor for the proprietor), and the "inhyseshjon" (persons who work without contract), 8.5 per cent; and the servants 16 per cent. A century later the peasants constituted about 55 per cent of the farming population, while the "base tenants" formed 15 per cent, the "backstugusittare" and "inhyseshjon" 14.2 per cent, and the servant class, 15.8 per cent. The rural population between 1751 and 1840 averaged 80 per cent of the total population, but in 1908 it was only 49.12 per cent. The cause of the variation is attributed to manufactures and emigration.

With the decrease of farm laborers there has been a noticeable increase in their wages, which is illustrated in the following table:

Wages of the various classes of agricultural laborers.

Years.	Annual ordinary wage of servants lodged and boarded by the master.		Annual wage of laborers on "mixed wage" (partly in kind and partly in money).		Daily wage in summer.		Daily wage in winter.	
	Men.	Women.	Men.	Women.	Men.	Women.	Men.	Women.
	Crowns.	*Crowns.*	*Crowns.*	*Crowns.*	*Crowns.*	*Crowns.*	*Crowns.*	*Crowns.*
1871–1875	154	61	375	214	1.82	0.86	1.20	0.60
1881–1885	153	66	366	213	1.55	0.83	1.04	0.57
1891–1895	173	84	404	225	1.78	1.02	1.21	0.71
1902–1905	233	123	507	286	2.21	1.30	1.54	0.93
1909	287	168	626	360	2.66	1.57	1.89	1.15

Other notes and tables are given showing phases of the social and economic conditions of the laborers.

Immigration and employment of Polish farm laborers in France (*Bul. Off. Travail [France], 18 (1911), Nos. 11, pp. 1071–1081; 12, pp. 1210–1219*).—The continually increasing scarcity of agricultural laborers in France has given rise to the establishment of a number of agencies whose purpose is to secure such laborers from beyond the frontier and arrange for their employment. The special efforts of these organizations in France, in cooperation with the Polish societies, to attract Polish laborers have met with reasonable success. Most of the agencies arrange contracts which stipulate the wages the laborers are to receive. Men and women field laborers engaged by the year usually receive from 324 to 528 francs ($62.53 to $101.90), including food and lodging, and if the laborer renews his contract for a second year from 420 to 624 francs. The wages of young men and women range from 240 to 350 francs a year, according to their aptitude and age.

Report of the Irish Agricultural Organization Society, Limited, for the year ending June 30, 1911 (*Rpt. Irish Agr. Organ. Soc., 1911, pp. 122*).—In this report it is shown that the growth of the cooperative movement among

farmers in Ireland has been steadily and satisfactorily maintained. There were 19 cooperative creamery societies formed during the year and 14 agricultural societies, making a total of 329 of the former and 168 of the latter. Cooperative credit banks increased from 234 to 237, and the total of cooperative societies from 835 to 905. Data are given showing the work of a number of individual societies. See also a previous note (E. S. R., 23, p. 795).

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 14 (1912), No. 4, pp. 25–32, fig. 1*).—This number includes notes and statistics showing the condition of winter wheat and rye; the condition of farm animals April 1, and estimated losses for a period of years and for the year ended March 31, 1912, with comparisons; farm value of crops and products on dates indicated; range of prices of agricultural products at important markets; monthly receipts and stocks of eggs and poultry in the United States, temperature and precipitation statistics, data as to high prices and crop production, apple shipments for 1911, and a diagram indicating the yearly trend of the per capita production and price of imported farm products.

It is concluded that the world's production of the staple food products has been increasing at a rate faster than the increase of population, and that "the recent advances in the 'cost of living' are not due to scarcity or lessening of agricultural products."

Agricultural statistics of Bengal for 1910–11 (*Agr. Statis. Bengal, 1910–11, pp. 77*).—Tables showing the total acreage, classification of areas, crops, and current fallows in each district of Bengal during the agricultural year ended March 31, 1911, are here presented.

AGRICULTURAL EDUCATION.

Provisions in the various Southern States for teaching agriculture, E. R. KONE (*South. Ed. Assoc., Jour. of Proc., 22 (1911), pp. 525–532*).—This article presents data and observations as to provisions made by the federal and state governments for instruction in agriculture in the various Southern States.

It is noted that a majority of these States make special provisions for teaching agriculture either in the public schools or in special agricultural schools as well as in the agricultural colleges. Other States have statutory provisions requiring such instruction in elementary or high schools, but make no special appropriations for it.

What constitutes successful work in agriculture in the high school, L. N. DUNCAN (*South. Ed. Assoc., Jour. of Proc., 22 (1911), pp. 532–536, pl. 1*).—The successful teacher in agriculture is here described as one who not only acquaints his pupils with truths and principles of soil formation, soil preparation, seed selection, cultivation, plant propagation, etc., but imbues them with the spirit of the subject and creates a desire for further study. A number of practical suggestions are presented showing the best methods for teaching agriculture and obtaining these desired and more lasting results.

Training of teachers for secondary courses in agriculture, A. C. MONAHAN (*Yearbook Nat. Soc. Study Ed., 11 (1912), pt. 2, pp. 9–21*).—In discussing the need and demand for teachers in agriculture and what is being done toward training them, it is noted that in 1910 agriculture was taught in over 100 special agricultural schools, and as a separate subject in more or less complete courses in 140 private high schools and 1,800 public schools to over 37,000 pupils. In 36 of the agricultural colleges opportunities are now offered for students to fit themselves as special teachers of agriculture in secondary school work. They may usually elect courses in general education and agricultural pedagogy, or take a prescribed 4-year course offered for teachers of

agriculture. A few institutions give a course for graduates preparing to teach agriculture.

The vocational agricultural school, with special emphasis on part-time work in agriculture, R. W. STIMSON (*Yearbook Nat. Soc. Study Ed., 11 (1912), pt. 2, pp. 22–53*).—This article discusses and illustrates in detail the work of the vocational agricultural school, as found, for example, in the congressional district schools of Georgia, the county agricultural schools of Wisconsin, or the state agricultural schools in undivided districts in a number of the States. Special emphasis is directed to the system of part-time work, where the pupil must spend part of the time required for his education in productive farm work, preferably at home, and part at the school, the work at both places being closely correlated and under the direction of the teacher.

A number of projects which might be taken up by such a school are outlined in detail and suggestions given for their proper execution.

State-aided departments of agriculture in public high schools, D. J. CROSBY (*Yearbook Nat. Soc. Study Ed., 11 (1912), pt. 2, pp. 54–65*).—It is noted that Kansas, Louisiana, Maine, Maryland, Massachusetts, Minnesota, New York, North Dakota, Texas, Virginia, and Wisconsin have appropriated funds to encourage the teaching of agriculture in existing public high schools. A number of these have also provided for courses in home economics and farm mechanics. Brief statements are given showing the character and amount of state aid and the requirements to be met in the different States.

It is found that the advantage of state aid over the local initiative system is that it insures better equipment in the way of laboratories, special apparatus, land, etc., and provides better supervision, which can more easily be made expert than where everything concerning courses of study and methods of teaching is left to town or county superintendents. Experts have already been employed by 3 of the States to supervise the work in agricultural instruction.

High school agriculture without state subsidy, W. H. FRENCH (*Yearbook Nat. Soc. Study Ed., 11 (1912), pt. 2, pp. 66–74*).—This paper deals largely with what has been done in agricultural education in those States which have not appropriated special funds or granted special subsidies to individual schools for the introduction of courses in agriculture, home economics, or farm mechanics. It is concluded that this work has already gone far enough to demonstrate that (1) there is an interest on the part of the people in agriculture as a subject of study; (2) agriculture correlates well with other science subjects; (3) intellectual power can be developed through it; (4) the lives of young men are redirected and turned toward agriculture; and (5) practical results in farming processes in the community are secured.

For further advancement of the work it is suggested that a greater interest be awakened in the public mind by extension and demonstration work; that the States grant special subsidies to the schools; and that the state institutions give special attention to the preparation of vocational teachers.

Short courses and extension work for agricultural high schools in the South, H. F. BUTTON (*Yearbook Nat. Soc. Study Ed., 11 (1912), pt. 2, pp. 75–82*).—This article describes the extension work of the Agricultural High School at Manassas, Va. Short winter courses lasting 6 to 8 weeks devoted to subjects of local agricultural interest have proved very successful, as have also illustrated lectures and demonstrations given in neighboring rural schools on many phases of agriculture. Interest has been aroused and efforts stimulated for a better and more permanent agriculture in the community.

Short courses and extension work in agriculture for high schools in the North, F. R. CRANE (*Yearbook Nat. Soc. Study Ed., 11 (1912), pt. 2, pp. 83–90*).—This article deals with short courses and extension work in agriculture

in high schools and special secondary agricultural schools in the northern portion of the United States, special reference being made to the agricultural schools of Wisconsin. It describes (1) short courses, including (a) a 16 weeks' course for boys who have had no training for farming, (b) a 2-year short course in dairying, (c) a farmers' lecture course, which includes a 16 weeks' young people's course usually during the winter, (d) a farmers' 1 week's school, and (e) institutes and summer tours; (2) extension work, consisting of demonstrations on the individual farm, and the organization of corn testing societies, grain growing associations, and social centers; (3) an information bureau, where the instructor answers personal inquiries, makes seed tests, Babcock tests, etc.; and (4) the distribution of publications.

Practical aid to the school garden movement by the United States Department of Agriculture, SUSAN B. SIPE (*Nature-Study Rev., 8 (1912), No. 2, pp. 51–53*).—A brief account is given of the operations of the Office of Experiment Stations in promoting the theoretical side of the school garden movement, and of the Bureau of Plant Industry in promoting its practical side.

The school garden as a center for the teaching of nature study, R. O. JOHNSON (*Nature-Study Rev., 8 (1912), No. 2, pp. 54–61, figs. 4*).—The author gives as one of the reasons why the school garden should be made the center for teaching nature study that "the child in the garden (a little world in itself) is placed on a battle ground of opposing natural forces which are identical in kind and behavior with those which he must necessarily meet in his subsequent life." It is also shown that garden work combines the serious and the pleasurable, makes the pupil stronger and more resourceful through the knowledge of his ability to deal with natural forces, furnishes a most potent motive for the learning of the formal lesson in nature study, enlists the interest of parents, furnishes easily accessible material for the nature study lessons, and guaranties a closer relation of nature study with other subjects in the curriculum. Incidentally it teaches a number of exceedingly interesting and profitable lessons, such as respect for the man who works with his hands, a sense of ownership or proprietorship which tends to develop independence, strength, and self-respect, an appreciation of the value of money, cooperation and neighborliness, and habits of neatness and orderliness.

School gardening, a fundamental element in education, B. J. HORCHEM (*Nature-Study Rev., 8 (1912), No. 2, pp. 62–66, fig. 1*).—The author considers that school gardening is fundamental in its relation to the physical and moral development of the child, and that a healthful and natural development will solve the social problems of the nation.

The civic aspect of school gardens, LOUISE K. MILLER (*Nature-Study Rev., 8 (1912), No. 2, pp. 74–77, fig. 1*).—The author points out that school gardens may become radiating centers of great influence for civic improvement. She refers to the department of school gardens in Cleveland, where there are 107 school gardens of from 1 to 5 acres for normal, backward, defective, blind, crippled, and tubercular children, boys in the detention school for the juvenile court, a kitchen garden for the domestic science class, and a botanic garden. In the schools last winter 60 illustrated lectures were given by the curator of school gardens on various phases of gardening and crop production.

Boys' potato clubs: How to grow the crop and organization, J. C. HOGENSON (*Utah Sta. Circ. 5, pp. 3–15*).—Directions are given for growing and handling potatoes and for organizing potato clubs.

Outlines in agriculture and home economics, E. T. FAIRCHILD (*Topeka, Kans.: Dept. Pub. Instr., 1911, pp. 35*).—The author indicates the necessary equipment, including soil and crop specimens, for instruction in agriculture,

offers suggestions to teachers, and outlines a course of study in agriculture based upon the Elements of Agriculture, by G. F. Warren (E. S. R., 21, p. 494), for class room instruction, and A Unit in Agriculture, by J. D. Elliff (E. S. R., 24, p. 293), for laboratory work. He considers that the subject can be presented satisfactorily in 3 recitation and 2 laboratory periods a week. The laboratory period should be double the class period and should come as the last exercise in the day, thus permitting the class to visit neighboring farms without returning to the school after the class period is over. A list of agricultural texts and reference books is included.

Outlines are also given of courses in home economics, a bibliography for students and teachers, and suggestions concerning equipment.

Syllabus of illustrated lecture on the peanut: Its culture and uses, W. R. Beattie (*U. S. Dept. Agr., Office Expt. Stas. Farmers' Inst. Lecture 13, pp. 23*).—In this lecture, prepared for the use of farmers' institute lecturers, the author gives instruction on the soil and its preparation; crop rotation in peanut culture; planting, fertilizing, cultivating, harvesting, and marketing peanuts; varieties of peanuts; uses of peanuts as food, for the production of oil, and as stock feed; and cost of growing peanuts and returns. A list of 50 lantern slides to illustrate the lecture and a list of reference literature are appended.

Syllabus of illustrated lecture on farm home grounds—their planting and care, S. W. Fletcher (*U. S. Dept. Agr., Office Expt. Stas. Farmers' Inst. Lecture 14, pp. 16*).—In this lecture, prepared for the purpose of aiding farmers' institute lecturers in the presentation of this subject, the following topics are considered: A house and a home, farm buildings, outbuildings, valuable trees, neatness, what to plant, the lawn, walks, and drives, and what will it cost. A list of 51 lantern slides to illustrate this lecture is appended.

Swine husbandry in Oregon, diversified crop production for the Oregon dry farmer, dairy cows and alfalfa, poultry production, J. Withycombe, E. L. Potter, H. D. Scudder, F. L. Kent, and J. Dryden (*Oregon Sta. Circ. 18, pp. 5–40, figs. 15*).—This circular, dealing in a popular way with the above subjects, was prepared for distribution on the farming demonstration train known as the Hog and Field Pea Special, and operated over the lines of the Oregon and Washington Railroad and Navigation Co., in conjunction with the Oregon College and Station.

MISCELLANEOUS.

Nineteenth and Twentieth Annual Reports of Oklahoma Station, 1910–11 (*Oklahoma Sta. Rpts. 1910–11, pp. 230, figs. 61*).—This contains the organization list, a report of the director on the work and publications of the station during the year, a financial statement for the fiscal years ended June 30, 1910, and June 30, 1911, brief outlines of work in progress, departmental reports, the experimental work of which is abstracted elsewhere in this issue, and reprints of Bulletins 86 to 92, Circulars 13 and 14, previously noted, Bulletin 93 noted on page 274 of this issue, and of press bulletins entitled The Melon Aphis, Experiments with Winter Wheat, Fall Plowing as a Means of Insect Control, Registration of Live Stock, How to Plant a Tree, The Melon Louse and Disease of Chinch Bug, Broom Corn, The San José Scale, and Alfalfa.

Report of the director for the year ending June 30, 1911, F. B. Mumford (*Missouri Sta. Bul. 101, pp. 201–236, figs. 2*).—This contains the organization list, a report of the director on the work and publications of the station, and a financial statement for the fiscal year ended June 30, 1911.

Index, Bulletins No. 83–96 (*Missouri Sta. Index Buls. 83–96, pp. 9*).

NOTES.

Alabama College and Station.—F. E. Lloyd, professor of botany and botanist, has been appointed Macdonald professor of botany in McGill University, and will enter upon his new duties September 10.

Arkansas University.—J. N. Tillman has resigned as president.

Colorado Station.—R. S. Herrick, field horticulturist at the Grand Junction substation, has accepted the position of horticulturist in extension work at the Iowa College, and entered upon his new duties August 15.

Illinois University and Station.—A new four-year course in agriculture has been outlined, whereby the first year's work and one-half that of each semester of the second year will be required. The remaining time will be available for specialization in soils, crops, agricultural teaching, horticulture, farm mechanics, dairying, or animal husbandry.

William Dietrich, assistant professor of swine husbandry, has resigned to become superintendent of a stock farm. B. R. Rickards has resigned to engage in commercial work, and will be succeeded as head of the division of municipal and sanitary dairying by H. N. Parker.

Michigan College and Station.—Leo M. Geismar, formerly superintendent of the substation at Chatham, has been transferred to extension work in the Upper Peninsula, with headquarters at Marquette.

Nevada University and Station.—L. T. Sharp, formerly connected with the soils laboratory of the California Station, has been appointed to have charge of soil research work in the station and to give instruction in soils in the university.

South Dakota College and Station.—Dr. Edgar W. Olive, professor of botany and botanist, has been appointed curator of the Brooklyn Botanic Garden, to have charge of the department of public instruction and also of work in plant pathology, this becoming effective September 1. C. M. Woodworth, instructor in agronomy; J. C. Hart, also a 1912 graduate, as superintendent of the Chatham of Plant Industry of this Department.

Virginia College and Station.—Press reports announce the resignation of President Barringer, and state that he has been asked to remain until July 1, 1913. Recent appointments include A. W. Drinkard, jr., who has been on leave of absence for two years at Cornell University, as associate horticulturist, beginning October 1; A. N. Hodgson, a 1912 graduate of the college, as assistant in agronomy; J. C. Hart, also a 1912 graduate, as superintendent of the Chatham substation; W. G. Harris as assistant chemist; and George W. Chappelear as assistant in agronomy in the college. T. B. Hutcheson, superintendent of plat work, has been granted leave of absence beginning October 1 to pursue graduate study at Cornell University. William Kerr, assistant animal husbandman, has resigned to engage in practical work.

EXPERIMENT STATION RECORD.

VOL. XXVII. SEPTEMBER, 1912. No. 4.

The act making appropriations for the support of the Federal Department of Agriculture for the fiscal year ending June 30, 1913, is noteworthy for its continuance of the general policies of recent years. Despite a general tendency for retrenchment wherever possible in the public service, no line of work now under way by the Department has been discontinued. The great majority of its projects are maintained on their present basis. Opportunity for additional development has been provided in several cases, and a few new undertakings have been authorized. This outcome may be regarded as especially significant and encouraging, indicating a sustained interest by the people of this country in the work of the Department as a whole, and a widespread realization of the importance of its uninterrupted continuation.

The new appropriation act was not passed until August 10. During the interval of nearly six weeks which followed the termination of the preceding fiscal year on June 30, the maintenance of the Department, as well as of most other branches of the Government, was provided for by the passage of special resolutions extending the appropriations, under certain restrictions, on the basis of the act of the previous year.

The aggregate carried by the act is $16,651,496, which exceeds that of any year except the one immediately preceding, when the total reached was $16,900,016. In the absence of serious forest fires, however, the reduction as compared with 1912 will be more or less nominal, since there has been a diminution from $1,000,000 to $200,000 in the fund for fighting forest fires in the National Forests in cases of extraordinary emergency. If this item is disregarded, there is an actual increase of $551,480 for the routine work of the Department, and a considerable increase over the original estimates submitted.

In its general form the law conforms closely to its immediate predecessor, but in addition to the provisions of a routine nature it contains considerable new legislation. This is particularly the case as

regards the National Forests. The Secretary of Agriculture is directed to select and segregate as soon as practicable all lands within the boundaries of such forests that may be opened to settlement and entry under the homestead laws applicable thereto. The sum of $25,000 is appropriated for this purpose, together with $35,000 additional for the survey and listing of lands within the reserves chiefly valuable for agriculture. Additional provision is also made for timber sales to settlers. The purchase of lands under the Appalachian Forest Reserve act of 1911 was aided by legislation making available until expended any balances remaining on June 30, 1912, and in succeeding years, and a new appropriation of $32,590 was granted for the maintenance of forest lands acquired under that act.

It will be recalled that by a clause in the appropriation act of May 23, 1908, 25 per cent of all receipts from each forest reserve is paid to the State in which the reserve is situated, to be expended as the legislature may prescribe for the benefit of the public schools and public roads in the locality. An additional 10 per cent of the receipts is now to be expended by the Secretary of Agriculture for the construction and maintenance of roads and trails within the respective National Forests in cooperation, if deemed practicable, with the State authorities.

By another new clause the sanitary provisions of the meat-inspection act of 1906 are extended to include renovated-butter factories. The Department is authorized to undertake experiments in the breeding of horses for military purposes, and to study the rearing of fur-bearing animals. A national game preserve is established within the Wind Cave National Park, in South Dakota, as a permanent range for a herd of buffalo to be presented to the United States by the American Bison Society, as well as for other native game animals, and an initial appropriation of $26,000 is made for buildings, fencing, and the procurement of a water supply. A similar reserve of 2,500 acres is provided in Wyoming as a winter refuge for elk, $45,000 being made available for the purchase of land and its equipment and maintenance.

Provision is again made for the investigation of the cost of food at the farm and to the consumer. In addition the Secretary is directed to collect information as to cooperative and other systems of marketing farm products in vogue in this country, and to make recommendations regarding further investigations of these and related questions.

An appropriation of $10,000 is provided for an exhibit by the Department illustrative of investigations, products, and processes relating to farming in the subhumid region, to be made at the next International Dry Land Congress, which will be held at Lethbridge.

Alberta, in October. An exhibit is also to be prepared for the Fifth International Corn Exposition, to be held at Columbia, S. C., from January 27 to February 9, 1913.

The continued spread of the chestnut bark disease, for combating which $5,000 was granted last year, has led to an increase of the fund to $80,000. It is provided that $10,000 of this sum is to be expended in the study of the relation of insects to the disease.

Provision for rental of quarters in the District of Columbia is made in a special clause carrying $95,329. A portion of this sum will be utilized for the rental of a modern six-story office building now nearing completion on ground practically adjoining the present laboratory buildings of the Department. The first four stories of this structure will be divided among several offices of the Bureau of Plant Industry which do not require laboratory facilities, and the remainder will be occupied by the Office of Experiment Stations, housing all of its activities except its nutrition investigations.

About one-tenth of the total appropriation is allotted to the Weather Bureau, which receives $1,619,680, an increase of $19,430. There is considerable readjustment of the various allotments, but it is expected that the increase will permit of additional employees and the more complete distribution of storm and frost warnings in connection with the protection of orchards and other crops. For the investigations in climatology and meteorology the previous allotment of $120,000 is reduced to $115,000.

The Bureau of Animal Industry also receives an enlarged appropriation, its total being $1,670,316. This, of course, does not include the permanent appropriation of $3,000,000 per annum provided for the Federal meat inspection in the act of 1906. The fund for inspection and quarantine work is slightly increased to provide for the maintenance of the recently acquired quarantine stations at the ports of Baltimore and Boston, and for the further extension of the work in the eradication of tuberculosis in domestic animals. The Dairy Division will receive $177,900, this including a net increase of $28,500 for the maintenance of the dairy work at the experimental farm at Beltsville, Md., the extension of the market milk and other educational work, and studies of the utilization of creamery by-products.

The allotment for cooperative experiments in animal feeding and breeding is doubled, the increase of $50,000 being in connection with the new project for experiments in breeding horses for military purposes. Increasing difficulty is reported by the War Department in securing remounts of the special types desired. Under the plan proposed the Government will purchase stallions of suitable type for free service in a number of districts, retaining under these conditions an option for the War Department on the foals. The remaining ap-

propriations of the Bureau are continued on essentially the present basis, $52,180 being available for other investigations in animal husbandry, $250,000 for the cattle tick eradication campaign, $78,680 for the study of animal diseases, and $16,500 for additional buildings at the Bureau farms.

The largest increase accorded to any bureau was received by the Bureau of Plant Industry, the total appropriation being $2,323,580, as compared with $2,061,686 in 1912. There is some readjustment of administrative details, but the majority of the projects are provided for much as before. The Congressional seed distribution, which is continued on the usual basis, will receive $226,940, and $58,740 will be available for the introduction of seeds and plants from foreign countries. There is also an appropriation of $52,430 for the testing of special seeds and plants, of which $40,000 is an increase for the purchase and distribution of drought-resistant field seeds, and $23,530 is provided for seed inspection. The pathological work of the Bureau receives specific allotments of $117,185, in addition to the appropriation for the chestnut bark disease already referred to.

The testing and breeding of fibrous plants has been extended to include work with flax straw in cooperation with the North Dakota College. Grain production and handling will receive $136,405. The expenditure of $8,000 for the purchase of spinning machinery is authorized in connection with studies of the ginning, handling, and grading of cotton. Other allotments are $86,015 for pomological work, $30,380 for studies in crop physiology, $26,145 for soil bacteriology and plant nutrition investigations, $33,300 for crop acclimatization work, $46,930 for work with drug plants, poisonous plants, and tea culture, $10,010 for crop technological and fiber plant studies, $15,655 for physical investigations, $26,630 for studies of methods of tobacco production and handling, $20,000 for the improvement of forage crops, $35,795 for work with sugar-producing crops, $21,930 for grazing investigations, and $49,930 for the maintenance of the greenhouses and the Arlington Experimental Farm.

The development of agriculture in the arid and semiarid regions was one of the objects to receive increased attention. The allotment for the study of dry-land methods was increased to $125,000, of which $50,000 will be available for the purchase and equipment of an experimental farm in the northern section of the Great Plains area to demonstrate the adaptability of agricultural and horticultural crops to the semiarid region. The studies in connection with the utilization of lands reclaimed under the Reclamation Act and similar areas were also continued with an allotment of $69,600, and specific authority was given the Bureau to conduct investigations in connection with western irrigation agriculture. Provision was also made

for the continuance of studies undertaken several years ago of the methods of clearing logged-off lands, the testing of powders in clearing them, and the utilization of the by-products, $5,000 being granted for the work. To investigate potato breeding and sugar-beet seed production for irrigated lands, a special appropriation of $10,000 was made.

Great interest was also evinced by Congress in those phases of the Department's work dealing with farm management, and there was evident approval of efforts to extend to the country as a whole practical demonstrations of improved methods of farming. The well-known work inaugurated by the late Dr. S. A. Knapp in the South was continued with an appropriation of $332,960, and its scope was so broadened that in future the entire cooperative demonstration enterprises of the Bureau in the South may be conducted under its auspices. In addition, appropriations were made aggregating $300,000 to "investigate and encourage the adoption of improved methods of farm management and farm practice and for farm demonstration work." This appropriation is under the administration of the Office of Farm Management of the Bureau, and will more than double the funds at its disposal. It is announced that a portion of this large increase will be utilized in the extension and development of the investigation work of the Office, which is now covering a wide range of activity. The act itself provides that $10,000 may be used in the investigation and utilization of cacti and other dry-land plants as food for stock, and other projects already under way or contemplated include the collection of data pertaining to the cost of various farm operations, the carrying on of farm surveys, the relation of climate to various farm enterprises, the effect of various types of farming on the maintenance of soil fertility, etc.

In the main, however, opportunity will be afforded to extend the demonstration phases of the work and thereby to establish closer relations with the individual farmer than ever before. Already, as is generally known, the Office has a well-developed system of organization, in which a State or group of States constitutes an administrative unit or district, in charge of an expert familiar with its needs in a broad way. In many cases cooperation with the agricultural colleges and experiment stations, county organizations, boards of trade and other commercial bodies, and many other agencies has permitted of numerous smaller divisions. The county unit has been established in several instances and has been found especially effective because of the opportunity for personal acquaintance and close familiarity with local conditions. Obviously little more than a beginning toward so detailed an organization as this can be expected, even with the enlarged appropriation, but the extension which will be possible

is expected to be of much assistance to the localities which can be reached thereby.

The largest allotment to any one bureau was made, as usual, to the Forest Service, although its appropriations show a reduction from $5,533,100 to $5,343,045. A cut of $100,000 was made in the allotment for permanent improvements, for which $400,000 will be available; one of $90,920 in that for statutory salaries and one of $43,080 for supplies, together with smaller reductions for several lines of investigation. The bulk of its appropriation will, of course, be expended in the maintenance of the National Forests, but there will also be available $20,180 for range studies, $165,640 for reforestation work in National Forests and experiments relating thereto, $83,728 for silvicultural and dendrological experiments, $31,360 for miscellaneous forest investigations and the preparation and dissemination of results, and $170,000 for investigations of methods for wood distillation and preservation, timber testing, and wood utilization for paper making and other purposes. Special attention is to be directed to studies of the availability for distillation purposes of Douglas fir and other northwestern species of fir and timber. The appropriation of $150,000 for fighting forest fires and similar emergencies was continued unchanged.

The appropriation of the Bureau of Chemistry was enlarged to $968,940, of which $25,000 represents an increase in connection with the enforcement of the Federal Food and Drugs Act of 1906. An additional inspection laboratory is being installed at San Juan, P. R.

The Bureau of Soils received an increase of $41,520, mainly for soil surveys and fertilizer investigations, making its total $301,420. The soil-survey work received $165,000, and a provision carried in the last act restricting to 10 per cent expenditures in any one State was omitted. The investigations of the sources of natural fertilizers, begun last year and carried on with special reference to potash, were continued, and the appropriation was doubled, making $25,000 available for the purpose. Studies of the relation of soils to drainage and seepage waters were also authorized, with an appropriation of $5,000.

Although the estimates of the Bureau of Entomology called for $601,920 as during the previous year, its appropriations reached a total of $672,340. Of this increase $35,000 was provided for a campaign against the much dreaded Mediterranean fly, which is causing considerable damage in Hawaii and much uneasiness to horticultural interests on the Pacific coast. The remaining increases were for studies of insects affecting cereal and forage plants, including the alfalfa weevil, and of insects affecting truck crops, sugar beets, and stored grains, and other products. The campaign against the gipsy and brown-tail moths was continued, no change being made in its appropriation of $284,840.

The Biological Survey will receive $191,400 as compared with $139,700 in 1912, its increases being mainly for the administration of the additional game preserves already mentioned. A special allotment of $3,000 is made for the destruction of ground squirrels in the National Forests in California. The general appropriation for biological investigations and the mapping of life zones was reduced from $20,000 to $10,000.

The various activities of the Office of Experiment Stations were continued, and in several cases with slightly enlarged appropriations. The total is $1,871,700, of which $1,440,000 is allotted to the State experiment stations under the Hatch and Adams Acts. Of the remainder $58,240 is for statutory salaries, $38,400 (a net increase of $2,500) for general expenses, and $15,760 (an increase from $10,000) for the agricultural education service. The Alaska, Hawaii, and Porto Rico stations will again receive $30,000 each, and the Guam Station $15,000.

The nutrition and drainage investigations each received small increases, the former being allotted $16,000 and the latter $100,000. For irrigation investigations $98,300 was granted, and a special investigation was directed of the feasibility and economy of irrigation by the reservoir system in western Kansas and Oklahoma.

The Office of Public Roads will have at its disposal $202,120, an apparent increase of $41,400. This increase will permit of additional assistance in meeting the rapidly growing demand for advice upon road construction and maintenance, and especially for additional field experiments in road making, road materials, and related questions.

A small increase is provided for the Bureau of Statistics, which will receive $240,680. The inquiries already mentioned as to marketing methods are included in the allotments of this Bureau.

The work of the remaining branches was continued much as at present, but with small increases in each case. The Office of the Secretary is given $292,280, the Library, $41,280; the Division of Accounts and Disbursements, $104,620; and the Division of Publications, $219,700; and the fund for contingent expenses is $106,066.

In connection with the appropriations included in the act itself reference should also be made to the funds derived in other ways. Mention has already been made of the permanent appropriation of $3,000,000 for the meat-inspection work and to the annual appropriation of $2,000,000 for the purchase of lands under the Appalachian Forest Reserve Act. There are also available until expended an appropriation of $200,000 for the protection from fire of forested watersheds of navigable streams, to be expended in cooperation with the States upon request, and a small appropriation for the feeding

of elk in Wyoming. The appropriation for the Department printing and binding is carried in the appropriation act for sundry civil expenses, the allotment for 1913 being $475,000, an increase of $5,000. The Post Office appropriation act contains an appropriation of $500,000 for expenditure by the Secretary of Agriculture in cooperation with the Postmaster General in studies of the possibilities of increasing the efficiency of the rural free delivery of mail by improving the condition of the roads, and conditional upon the raising by the States or local communities of double the Federal allotment. There should also be added $25,000, included in an act approved August 20, 1912, providing for the inspection of imported nursery stock, a number of small deficiency appropriations, and an emergency appropriation of $5,000, which went into effect July 30, for work in exterminating the army worm which has been causing considerable devastation to crops in the Southern States.

Eliminating the deficiency appropriations and the indefinite appropriations for watershed protection and elk feeding, the grand total for the Department and the State experiment stations becomes $22,656,496. This is a considerable sum, although it will probably represent less than one-quarter of 1 per cent of the value of the farm crops of the year. When it is recalled that large appropriations will also be available for agricultural education in the land-grant colleges under the Morrill and Nelson Acts, for the rural education work of the Bureau of Education, demonstration work in agriculture among the Indians, certain phases of the census work of direct agricultural interest, and the payment of the country's quota toward the support of the International Institute of Agriculture, the wide extent to which the principle of Federal assistance to agriculture is being carried into practice becomes apparent. The further fact that most of the lines of work are provided for solely by annual appropriations and yet are being steadily continued, and in many cases still further augmented, indicates an increasing recognition of the benefits accruing to the country as a whole from a consistent and uninterrupted fostering of its agricultural development.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Studies on malic acid.—I, The transformation of malic acid to sugar by the tissues of the maple (Acer saccharinum), W. R. Bloor (*Jour. Amer. Chem. Soc., 34 (1912), No. 4, pp. 534–539*).—With a view to determining whether the tissues of the maple tree were capable of transforming malic acid into sugar, tests were made with neutral calcium malate obtained by twice recrystallizing "sugar sand" acid calcium malate obtained by precipitating half the calcium from the neutral malate by means of oxalic acid and recrystallizing the product, malic acid obtained by removal of all the calcium from the crude neutral malate by oxalic acid (this product contained a small amount of cane sugar as an impurity), and pure malic acid obtained by precipitation of all the calcium from the neutral calcium malate. As it was believed that the transformation would be greatest in those parts of the tree showing signs of life at the time of the sap flow, viz, the swelling buds and shoots, aqueous extracts of these parts were made and the malic acid preparations added. Blanks were also prepared containing no malic acid, some solutions of the tissues were exposed to sunlight for certain periods of time, others kept in darkness, and other lots of tissues extracted with water or boiled. The amount of acidity and sugar was determined in each case.

The results showed that with the shoot tissues mixed with malic acid or malates and exposed to sunlight a diminution of acidity and an increase in reducing substances took place. This was interpreted as a transformation of malic acid into sugar. "A less pronounced change of the same kind is produced in darkness at 38°. The active principle which produces the change is somewhat soluble in water, is destroyed by boiling, and is therefore probably of enzym nature. The tissue of maple buds similarly treated brings about a decrease of reducing substance and an increase of acidity in solutions of malic acid or its salts."

The chemical composition of the substances contained in the birch, G. Grasser (*Collegium, 1911, Nos. 484, pp. 393–402; 485, pp. 405–412; 486, pp. 413–420; 487, pp. 421–425; abs. in Jour. Soc. Chem. Indus., 30 (1911), No. 24, p. 1462*).—The author treated the residue obtained from the alcoholic extraction of 2 kg. of leaves from the white birch (*Betula alba*) with cold alcohol, ethyl ether, and dilute caustic potash solution and sulphuric acid, purified the constituents by further treatment, and observed their solubility in various liquids, together with their behavior with various reagents.

"The fraction of the extract dissolved by ether contained a wax-like, dark green mass of a resinous character, soluble in petroleum ether, which was found to have the composition $C_{39}H_{68}O_2(OH)COOH$, and yielded substitution products with metallic salts of the type $C_{39}H_{68}O_2(OH)COO.Cu.COO(OH)O_2H_{68}C_{39}$. The ethyl ester and also the acid chlorid and amid were prepared from it. By oxidation with fuming nitric acid, butyric acid was produced.

"The research showed that the substances which can be isolated unchanged from the young leaves of the birch consist principally of a resin, besides tannins of the pyrocatechol group and indifferent coloring matters. The absence of betulin and other glucosids in the leaves shows that these are derivatives of the compounds found and occur in older parts of the plant and particularly in the bark. The dry distillation of the resin from the leaves yields an odorous oil similar to that obtained from the bark, which shows that it has already the specific character of the birch product, its odor being similar to that conferred on Russian leather by tanning with birch bark."

In regard to the occurrence of formyl and acetyl groups in lignin, W. E. Cross and B. Tollens (*Jour. Landw., 59 (1911), No. 2, pp. 185–196; abs. in Chem. Ztg., 36 (1912), No. 9, Repert., p. 37*).—This material has been substantially noted from another source (E. S. R., 25, p. 803).

Plant coloring matters, O. A. Oesterle (*Schweiz. Wchnschr. Chem. u. Pharm., 50 (1912), Nos. 9, pp. 121–130; 10, pp. 137–141*).—A review of the chemistry of the vegetable coloring matters.

In regard to chlorophyll, K. Kautzsch (*Naturw. Rundschau, 26 (1911), Nos. 20, pp. 249–252; 21, pp. 261–264*).—This is a review of present knowledge in regard to the chemistry of chlorophyll.

Colloid chemistry of foods and condiments, H. Bechhold (*Chem. Ztg., 35 (1911), No. 151, pp. 1401–1403*).—Numerous examples are cited to support the hypothesis that the foundation of the preparation and judgment of foodstuffs and condiments lies in colloid chemistry.

Yearly reports in regard to the progress made in the examination of foods and condiments, H. Beckurts, H. Frerichs and H. Emde (*Jahresber. Untersuch. Nahr. u. Genussmtl., 19 (1909), pp. 210; 20 (1910), pp. 166*).—These are the reports for the years 1909 and 1910.

Determination of ustillaginous spores in wheat bran, G. Gróh (*Kisérlet. Közlem., 14 (1911), No. 4, pp. 569–580, figs. 2*).—Two methods are described for determining ustillaginous or smut spores in wheat bran.

In the first method the spores are washed from the bran with water. The starch which is carried over is dissolved and the fluid centrifuged. The protein precipitate, which settles with the spores, is removed by dissolving it with dilute sulphuric acid, and the spores are counted in an aliquot with a counting chamber. On the basis that 1 gm. of a clean sample of spores with a water content of 12 per cent contains 882,000,000 spores, the results can be expressed in percentages by weight.

In the second method 10 gm. of the bran is shaken with some water in a 100 cc. flask, the mixture made up to a bulk of 100 cc. with water, and the whole transferred to a beaker glass. After mixing the fluid thoroughly with a spoon a drop is taken from the surface of the fluid with a glass rod and placed in a counting chamber 0.1 mm. deep and with 16 squares 0.25 mm. on a side. On multiplying the average spore content of one preparation by 0.01133 the spore content of the bran is obtained in percentage by weight.

Inspection of foreign cyanogenetic haricot beans imported into France, Gautier and Bordas (*Ann. Falsif., 4 (1911), No. 31, pp. 285, 286; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 7, p. 1757*).—Only beans obtained from Burma are allowed to enter France, and these only when their hydrocyanic acid content does not exceed 20 mg. per 100 gm. An ordinary external examination was not found to be sufficient to detect cyanogenetic varieties, and accordingly the authors recommend a microscopic examination and a chemical analysis for hydrocyanic acid content.

A new method for calculating water in canned tomatoes and the detection of added water to canned tomatoes, L. A. Congdon (*Jour. Indus. and Engin.*

Chem., 3 (1911), No. 10, pp. 744–747).—The acidity of 46 out of 58 samples of canned tomatoes fluctuated between 50 cc. and 70 cc. of decinormal sodium hydroxid for 100 cc. of juice, and with an average of 59.7 cc. The average specific gravity of the juice from these 46 cans, strained through a cheese cloth of 40 threads to the inch, was 1.0202 at room temperature. The amount of water in the entire 58 samples varied from 90.44 to 96.18 per cent, and of the 46 samples was 93.95 per cent.

On the basis of the above figures the author evolved methods for determining the water in canned tomatoes and the detection of added water. For ascertaining the former the acidity of 100 cc. of juice, expressed in cubic centimeters of decinormal sodium hydroxid solution, is obtained. This figure is divided by 0.1 plus the specific gravity of the juice strained through cheesecloth, and the result (which is termed the ratio) subtracted from the acidity figure. The remainder is then taken from 100. In other words, 100 per cent minus the acidity, minus the ratio, equals the percentage of water.

The excess of water or added water in canned tomatoes is found by subtracting from the percentage of water found 90.44 per cent (the average percentage of water in canned tomatoes of the proper acidity). The highest amount of water added was found to be a little over 5 per cent. The excess water in the tomatoes was due to the addition of brine, used by some factories for conserving the tomatoes previous to canning. The average amount of salt in canned tomatoes was 0.14 per cent.

The above formulas can not be employed for cold packed tomatoes.

Osmotic activity in the egg of the common fowl, A. D. GREENLEE (*Jour. Amer. Chem. Soc., 34 (1912), No. 4, pp. 539–545*).—As a result of examining White Leghorn eggs at various periods during storage, and at temperatures varying from 32 to 80° F., it was found that the decrease in moisture in the white of the egg was not entirely due to evaporation by the external atmosphere. A certain portion of this moisture seemed to be transferred to the yolk, and this may be explained by the simple process of osmosis.

"The yolk, which contains a very high percentage of solids, is surrounded by a membraneous tissue called the vitellin membrane, which in turn is surrounded by the egg white, a liquid much more dilute than the yolk. By osmosis the water passes through the membrane from the more dilute to the more concentrated solution until an equilibrium is obtained. In the egg this process continues until the vitellin membrane becomes so weak that it breaks, when the white and yolk begin to lose their identity. This action proceeds with such definiteness that by a process of calculation, knowing the original weight of the egg, the loss in moisture to the external atmosphere can be calculated with surprising closeness to the actual loss as shown by the balance."

As the change in water content increases its rate with the temperature, and diminishes with the time, it is possible by means of a rate formula which is given to predict the condition of the eggs at any temperature and at a given time within a reasonable storage period. Therefore, "the rate multiplied by the time gives the loss in weight, from which data it is a simple matter to find the percentage of moisture remaining."

The value of the guaiac tincture test for differentiating raw from boiled milk, RIEVEL (*Deut. Tierärztl. Wchnschr., 20 (1912), No. 11, pp. 161, 162; Molk. Ztg. Berlin, 22 (1912), No. 13, pp. 146, 147*).—Tewes' statements (E. S. R., 27, p. 13) in regard to the reliability of this test are not deemed valid under ordinary conditions. The chief reason for obtaining a positive reaction with some milks is that they have not been properly pasteurized or boiled.

Better cream through grading.—A new butter moisture test, G. H. BENKENDORF (*Wisconsin Sta. Bul. 220, pp. 14, figs. 2*).—In this bulletin the advantages

to be gained by grading cream are pointed out, and the establishment of 2 grades is recommended. The method of determining the acidity of cream by the use of alkaline tablets which is employed at the station is described.

"A new moisture test for butter [is also described, which] requires only 5 minutes for heating the butter, and is as accurate for practical purposes as the test made by the Wisconsin high pressure steam oven. The apparatus is a cast-iron oven 3½ by 3½ by 1¼ in., with walls ⅛ in. thick set on a closed stand high enough to admit an alcohol lamp. The bottom of the sample dish is protected from excessive heat by a sheet of asbestos, while the conductivity of the iron supplies top heat to the sample and prevents foaming and spattering." Practical suggestions for using the test are given.

The determination of moisture in butter, A. C. D. RIVETT (*Chem. News, 104 (1911), No. 2714, pp. 261–263, fig. 1*).—An accurate method of determining the amount of moisture in butter is described, which depends on the action of water upon calcium carbid (E. S. R., 25, p. 410). Instead of measuring the acetylene evolved during the process the amount was found by determining the difference in weight before and after evolution. The apparatus used for the test is described and illustrated.

On comparing the results with those obtained by the ordinary heating method a difference of from 0.2 to 0.3 per cent was noted with butters having a moisture content of more than 12 per cent. These differences are probably due to the loss of volatile matter other than water brought about by direct heating.

The refraction of the nonvolatile acids of butter, A. VAN RAALTE and F. A. J. LICHTENBELT (*Ztschr. Untersuch. Nahr. u. Genussmtl., 23 (1912), No. 3, pp. 81–98*).—The purpose of this work was to determine the value of estimating the refraction of the nonvolatile acids of butter as an index for detecting adulteration. The authors conclude that in general the refraction of the nonvolatile acids of butter will give very little clue in determining whether a butter is pure or adulterated, very little more, in fact, than is obtained from the refraction of the butter fat itself or the Reichert-Meissl number.

A modified butyrometer for determining the fat content of cheese, H. VAN GULIK (*Ztschr. Untersuch. Nahr. u. Genussmtl., 23 (1912), No. 3, pp. 99–101, fig. 1*).—This is a Gerber butyrometer so modified that it can be employed for determining the amount of fat in cheese.

In regard to the use of reversed filtration and the Weender methods for determining crude fiber, J. SCHRÖDER (*Jour. Landw., 59 (1911), No. 2, pp. 105, 106*).—A polemic, in which the author points out that he has used the method of reversed filtration in conjunction with the Weender method for determining crude fiber for many years. He states that with the method a chemist can make from 12 to 16 single determinations of crude fiber within 8 hours.

A micro-chemical test for digestible cellulose in feces, J. AMANN (*Schweiz. Wchnschr. Chem. u. Pharm., 49 (1911), No. 48, pp. 697–700; abs. in Chem. Abs., 6 (1912), No. 7, p. 875*).—According to the author neither the Schmidt and Strasburger nor the Simon and Lohrisch methods, nor the direct microscopic examination of feces, will determine whether or not the residual cellulose present therein is digestible. For this purpose he proposes a micro-chemical reagent which is composed of 10 gm. of anhydrous zinc chlorid, 2.5 gm. of potassium iodid, 0.25 gm. of iodin, and 10 gm. of distilled water.

"To apply the test, a small particle of fecal matter, or better, some of the sediment obtained by centrifuging a suspension of comminuted fecal matter in water, is put on a slide, a drop of the reagent cautiously added and the object at once examined under the microscope. Lignified or surface-hardened cell walls and other débris of indigestible cellulose are colored yellow or brown; merely thickened cell walls remain uncolored, but digestible cellulose is stained a char-

acteristic violet leaning more or less toward blue. This is seen, e. g., in the fecal débris of cellulose from bread or boiled potatoes. Simon and Lohrisch state that bread contains 0.2 to 0.4 per cent, potatoes 1.4 to 1.5 per cent of cellulose. Since starch and amylobacteria are turned more or less dark blue by this reagent, the latter detects and characterizes the 4 principles mentioned when they occur together. The observation should be made immediately, because upon prolonged contact with the reagent, thickened cellulose will also exhibit violet coloration."

The canning of foods, A. W. Bitting (*U. S. Dept. Agr., Bur. Chem. Bul. 151, pp. 77*).—This is a description of the methods followed in commercial canning enterprises. The object of the bulletin is to present in a popular form the methods in use in the better types of canning factories, to give teachers of home economics a more accurate idea as to this line of work, and to point out to the consumer what he may reasonably expect when purchasing canned goods, and finally what goes into canned goods. It deals with the early history and theories of preservation by canning; sterilization; modern factory equipment and methods; and detailed consideration of the various products, including fruits, vegetables, marine products, milk, and various specialties and soups.

Peach drying in Chile (*Bul. Mens. Off. Renscig. Agr. [Paris], 10 (1911), No. 6, pp. 707–710; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 7, pp. 1748, 1749*).—"The fruit-drying industry is widespread in Chile, especially in the province of Coquimbo, chiefly in the departments of Elqui and Ovalle, where the hot, dry climate and the high elevation promote rapid evaporation and make natural drying possible. There are two qualities of dried peaches. Those which are peeled and stoned before drying (descarozados), and those which are peeled and dried with the stones inside (huesillos)."

All varieties grown in Chile have adhering stones. Although the trees as a rule are not properly cared for, the average yield of irrigated, but not pruned, trees is about 220 lbs. of fruit per tree, varying from 110 to 660 lbs. The peaches are gathered before ripening, peeled by hand, sulphured, and exposed to the sun, wind, and dew for 3 days on wicker frames. After this the stones are removed with a short triangular-bladed knife (the smaller peaches are dried with the stone), and again placed on the wicker frames for a period of 3 days. This completes the process. Twenty-two lbs. of fresh peaches yield 4.4 lbs. of peels, 2.2 lbs. of stones, and 4.4 lbs. of dried fruit.

[Converting low-grade vinegar into good vinegar], W. G. Sackett (*Colorado Sta. Rpt. 1911, p. 21*).—This is a report of progress on a method by which low-grade vinegar (1 per cent acetic acid) can be converted into good vinegar conforming to the legal standard of 4 per cent acetic acid. This is accomplished by introducing a pure culture of yeast along with a culture of acetic acid bacteria, and by adding a 2 per cent cane-sugar solution to the low-grade product. In the experiments a product was obtained within 2 months which showed 5.7 per cent of acetic acid.

Bacteria interfering with the malting process, H. T. Güssow (*Canada Expt. Farms Rpts. 1911, pp. 241–244*).—A description is given of a barley infected with *Bacterium herbicola rubrum* which was obtained from a virgin prairie field. On malting the barley the organism manifested itself by forming a pinkish growth which attacked the radicles and permeated the endosperm. On washing the grain with lime water before malting, no further trouble was experienced.

The oil industry in Algiers, J. Foussat (*Gouvt. Gén. Algéric, Dir. Agr., Inform. Agr. Bul. 12, 1912, pp. 132, pls. 7, figs. 44*).—This is a discussion of the economic situation, and the technology involved in the olive oil industry. It

also contains a short description of the methods for utilizing the by-products of the olive, the preparation of olive conserves, some chemical methods for examining olive oil, and plans illustrating the various types of oil factories.

The antiseptic effect of creosote oil and other oils used for preserving timber, J. M. WEISS (*Jour. Soc. Chem. Indus., 30 (1911), No. 23, pp. 1348-1353*).—This work was done with pure cultures of *Bacillus subtilis*, *Saccharomyces glutinis*, and a species of Penicillium closely resembling the species described in Bulletin 118 of the Bureau of Animal Industry of this Department (E. S. R., 22, p. 531).

S. glutinis "developed slowly on sterile wood, but after a few months showed its characteristic red color on the surface, and a microscopic examination of a thin section of the surface wood showed evidences of destructive action. The same was noticed with the bacillus, but neither seems to have a high degree of virility. The important feature seems to be that they make sound wood more susceptible to the attacks of higher fungi by a preliminary comparatively slight decomposition. The [Penicillium] grows very quickly on wood, and after 2 months the wood shows distinct signs of decay microscopically."

The materials investigated as regards the preservative action for wood were creosote oil with the bases, acids, and solid hydrocarbons removed, various materials added, water-gas tar distillates, pure phenol, cresol, naphthalene, anthracene, quinolin, and paraffin, and commercial creosoting oils. The results obtained are briefly summarized as follows:

"The neutral oils of creosote are strong antiseptics. The middle portion of these neutral oils from 235 to 270° is the strongest, the higher boiling oils are considerably weaker, the lower oils slightly so. High boiling bases of coal tar are strong antiseptics. The coal-tar acids are very strong antiseptics, their efficiency rising with the boiling point. The solid hydrocarbons, naphthalene and anthracene, have low antiseptic value. The addition of filtered tar in moderate amounts to creosote does not materially reduce its antiseptic value. Paraffin has no antiseptic qualities. Water-gas tar distillates have lower antiseptic value, and in this respect are decidedly inferior to the neutral coal-tar oils. Coal-tar creosote is in the highest degree superior as an antiseptic preservative to the water-gas tar distillates and petroleum residues, used for the same purpose."

Maize straw; its use for the manufacture of paper and fodder, B. DORNER (*English Patent 8638, April 7, 1911; abs. in Jour. Soc. Chem. Indus., 30 (1911), No. 23, p. 1376*).—"Maize stems are freed from dirt by treatment in a beating and dusting machine: they are then cut up, steeped in water, and shredded into fibers by special tubular refiners. The shredded material is boiled with a dilute solution of acetic acid (0.2 to 0.4 per cent) under a pressure not exceeding 3.8 atmospheres, the digesters being arranged in series so that the liquid from one may be used in the next on the counter-current principle. In this way 17 to 18 per cent of the straw can be extracted. The material is next boiled with lime-water, and, as this becomes neutralized, further small additions of alkaline liquid are made, e. g., milk of lime, a 0.2 per cent solution of sodium carbonate, or 0.1 per cent solution of sodium hydroxid. The end of the operation is indicated when neutralization of the alkali becomes slow. The acid and the alkaline extracts of the stems are evaporated separately to a sirupy consistency, then mixed and absorbed by finely ground maize stems to form a fodder. The extracted material is converted into paper pulp by digestion with sodium hydroxid, the pith cells being separated by treatment on sieves."

The sugar content of maize stalks, G. N. BLACKSHAW (*So. African Jour. Sci., 8 (1912), No. 8, pp. 269–273*).—This article gives the results of an investigation of the Stewart method, which, briefly stated, consists of removing the

cobs from the corn stalk in the milk stage instead of allowing them to mature their grain. The object of doing this is to increase the saccharose content of the stalk until it practically becomes a sugar cane. Coincident with this, as a secondary result, it is claimed that there is very little deposition of the hard siliceous matter which forms the outer coating of the maize stalk and becomes incorporated with the peripheral fibers when the grain is allowed to ripen, thereby preventing the best of the fibrous matter from being utilized for the manufacture of pulp. In consequence of this, the whole substance of the stalk is resolvable into pulp, and cellulose of the finest quality for paper and for all the higher uses for which cotton cellulose is now employed may be obtained.

The author found, however, that "the sugar content of the cobbed and the uncobbed plants examined was practically the same; in other words, that the removal of the cob in the milky stage had no material influence upon the sugar content of the stalk."

See also previous note by Doby (E. S. R., 24, p. 707).

The microscopy of certain paper pulps, T. F. Hanausek (*Papier Fabrik., 9 (1911), No. 48, pp. 1464, 1465, figs. 2; abs in Jour. Soc. Chem. Indus., 30 (1911), No. 24, p. 1446*).—This is a description of the microscopical characteristics of paper pulps made from giant spear grass, which grows in the Terai district of India, and Kaing grass, which has its habitat in the Indian monsoon region.

The microscopy of paper made from cane bagasse, T. F. Hanausek (*Papier Fabrik., 9 (1911), Sonderausgabe, pp. 25–38, figs. 5; abs. in Internat. Sugar Jour., 14 (1912), No. 157, pp. 55, 56, fig. 1*).—A study of the microscopic characteristics of paper made from cane bagasse. The article is illustrated.

METEOROLOGY—WATER.

Meteorology, W. I. Milham (*New York, 1912, pp. XVI+549, pls. 14, figs. 143, charts 34*).—This is essentially a text-book embodying a revision of the junior and senior elective course in meteorology delivered at Williams College during the past 8 years. "The book is also intended for the general reader of scientific tastes." Each chapter begins with a syllabus and ends with a list of references. A bibliography is given in an appendix.

The book "can hardly be called an elementary treatise, but it starts at the beginning and no previous knowledge of meteorology itself is anywhere assumed. It is assumed, however, that the reader is familiar with the great general facts of science." No attempt is made to discuss mathematical meteorology, meteorology applied to living things, meteorology and medicine, and the history of meteorology.

On the estimation of humidity in agricultural meteorology, M. Nerucev (*Khozâistvo, 7 (1912), No. 4, pp. 89–95; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 4, pp. 862, 863*).—Eleven years' observations on the relation of rainfall and yields of spring wheat gave inconclusive results, indicating the impossibility of drawing absolute conclusions from observations on a single factor. An important but often neglected factor is "the evaporating power of the soil and of plants, which is often two or three times as great as the atmospheric precipitation. . . . It is clear, therefore, how this factor must be regarded in calculating the balance of moisture in the soil available for plants. Zebediev has been led by his investigations to the opinion that the aqueous vapors which condense on the ground are of much importance, as they increase the reserve of subsoil water. Consequently, in studying the action of moisture on plant life, it is necessary to examine the conditions which, by accelerating or retarding the processes of condensation, determine the cir-

culation of aqueous vapor from the soil to the surrounding atmosphere, and again from the latter to the soil."

Bulletin of the Mount Weather Observatory (*U. S. Dept. Agr., Bul. Mount Weather Observ., 4 (1912), pts. 4, pp. 183–304, figs. 38; 5, pp. 305–395, figs. 24; 6, pp. 397–456, figs. 13*).—These numbers contain the following articles:

Part 4.—Free Air Data: Sounding Balloon Ascensions at Indianapolis, Omaha, and Huron, by W. R. Blair.

Part 5.—Vertical Temperature Gradients in Hawaii, by A. J. Henry; Diurnal Variation of Pressure at Point Reyes Light, by J. Jones; The Temperature at Mount Weather and Adjacent Valley Stations (illus.), by A. J. Henry; and Free Air Data at Mount Weather for July, August, and September, 1911 (illus.), by W. R. Blair.

Part 6.—Dust Layers in the Atmosphere and Changes in the Neutral Points of Sky Polarization, by W. J. Humphreys; The Upper Atmosphere (illus.), by W. J. Humphreys; Echelon Clouds (illus.), by W. J. Humphreys; Review of Busch and Jensen "On the Facts and Theories of Atmospheric Polarization," by H. H. Kimball; and Free Air Data at Mount Weather for October, November, and December, 1911 (illus.), by W. R. Blair.

Monthly Weather Review (*Mo. Weather Rev., 40 (1912), Nos. 1, pp. 1–162, pls. 10, figs. 3; 2, pp. 163–320, pls. 10, figs. 2*).—In addition to the usual climatological summaries, weather forecasts and warnings for January and February, 1912, notes on the application of upper-air observations to weather forecasting, January and February, 1912, river and flood observations, lists of additions to the Weather Bureau library and of recent papers on meteorology and seismology, condensed climatological summaries, and climatological tables and charts, these numbers contain the following special papers:

No. 1.—Hydroelectric Development at Tallulah Falls, Ga., by C. F. von Herrmann; Climatic Charts of Savannah, Ga. (illus.), by J. deB. Kops; Winter Damage to Peaches, by J. W. Smith; The Climate of the City and Country Compared, by J. W. Smith; Notes on the Rivers of the Sacramento and San Joaquin Watersheds for January, 1912, by N. R. Taylor; A Study of Dry Seasons in San Diego, by F. A. Carpenter; Studies in Frost Protection—Effect of Mixing the Air (illus.), by A. G. McAdie; and Report on the January, 1912, Freshet in the Willamette River, by E. A. Beals.

No. 2.—Storm of February 22, 1912, at New York City, by C. D. Reed; The Average Stream Flow of the Coosa and Alabama Rivers, by C. F. von Herrmann; Smudging Against Frost; Storm of February 20, 1912, at Austin, Tex., by A. Deussen; The Cooperative Weather Bureau Observers of Utah, by J. C. Alter; Notes on the Rivers of the Sacramento and San Joaquin Watersheds during February, 1912, by N. R. Taylor; Weather at Fresno, Cal., during February, 1912, by W. E. Bonnett; Note on the Weather at Point Reyes Light, Cal., during February, 1912, by J. Jones; Effect of Abnormal Weather Conditions during the Construction of the Los Angeles Aqueduct, Abstracted from Report of the Engineers, by A. G. McAdie; and Covering Almond Trees for Frost Protection (illus.), by A. G. McAdie (see p. 345).

The weather of the past agricultural year, F. J. Brodie (*Jour. Roy. Agr. Soc. England, 72 (1911), pp. 418–424*).—The weather conditions for the British Isles during 1911 are summarized in the usual form and compared with the averages for previous years. The main characteristics of the weather of the year were a deficiency of rainfall and excess of temperature and sunshine.

The weather of Scotland in 1911, A. Watt (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 24 (1912), pp. 337–349*).—This report, like those of previous years, "consists of (1) a general description of the weather over the Scottish area from month to month; (2) a selection of rainfall returns, in which each

county in Scotland is represented by one or more stations. . . . The outstanding features of the year were the high level at which the barometer stood for long periods during the first 10 months, the large amount of mild or warm weather experienced, and the remarkable rainfall shortage in some eastern districts."

The chemistry of rare rain (*Lancet* [*London*], *1912, I, No. 19, p. 1291*).—Examinations of rain which fell in London after a 5 weeks' drought, the sample being taken about 1 hour after the rain began to fall, showed 0.525 gr. of ammonia per gallon of water. This is about seven times more than is found in rain collected under normal conditions.

The fertilizing value of rain and snow, F. T. SHUTT (*Canada Expt. Farms Rpts. 1911, pp. 200, 201*).—This is a report on the fourth year's work on this subject (E. S. R., 24, p. 417), covering the year ended February 28, 1911. The precipitation during this year was 26.97 in., about 10 in. below the average for the locality. The total nitrogen per acre brought down by rain and snow was 5.27 lbs., about 84 per cent being furnished by the rain and 16 per cent by snow. Of the total nitrogen, 3.73 lbs. was in the form of free and albuminoid ammonia and 1.54 lbs. as nitrates and nitrites.

Observations on the ground water level, F. VOGEL (*Mitt. Dcut. Landw. Gesell., 27 (1912), No. 23, pp. 328–330, figs. 4*).—The importance from the standpoint of water supply, drainage, etc., of systematic observations on the level of the ground water by means of tubes put down in the soil, and methods of making and interpreting such observations, are briefly discussed.

Report of progress of stream measurements for the calendar year 1910, P. M. SAUNDER (*Dept. Int. Canada, Sess. Paper No. 25d, 1912, pp. 244, pls. 16*).—Descriptions of the stream and creek basins are given, the methods of procedure outlined, and a large amount of tabulated data and stream measurements are given.

The water supply of farm homesteads, F. T. SHUTT (*Canada Expt. Farms Rpts. 1911, pp. 201–206*).—Analyses of 130 samples of water are reported, of which 43 were considered wholesome, 36 suspicious, 33 seriously contaminated, and 18 saline.

Sterilization of drinking water by ultraviolet light, J. COURMONT (*Chem. Ztg., 35 (1911), No. 87, p. 806; abs. in Jour. Soc. Chem. Indus., 30 (1911), No. 16, p. 1027; Chem. Abs., 6 (1912), No. 9, pp. 1190, 1191*).—"The author discusses the remarkable sterilizing power of the ultraviolet light from a quartz mercury vapor lamp. For sterilizing water, which is comparatively transparent to the radiation, it is sufficient to place the lamp in the axis of a cylindrical vessel 60 cm. in diameter. Liquids containing colloids (wine, beer, peptone solution, etc.) absorb the ultraviolet rays rapidly, and therefore sterilization is limited to the surface layer. It is therefore necessary that for greatest efficiency the water to be sterilized must be as clear as possible. The action of sterilization is in no way connected with ozone or hydrogen peroxid formation."

Purification of water by Infusoria, C. S. STOKVIS and N. H. SWELLENGREBEL (*Jour. Hyg.* [*Cambridge*], *11 (1911), No. 4, pp. 481–486; abs. in Chem. Abs., 6 (1912), No. 9, p. 1191*).—The investigations here briefly reported are summarized as follows:

"Infusoria have the same bactericidal power as flagellates. Emulsions containing *Bacillus typhosus, Vibrio cholerœ, V. Dunbar, V. El Tor, B. megatherium,* and *Spirillum volutans,* to which *Colpoda cucullus* is added, are soon cleared. Before the clearage the Colpodæ multiply actively.

"This bactericidal effect does not depend upon the production of toxic substances by the Infusoria. The fluid obtained from filtered cultures of the

Infusoria exerts no bactericidal effect. Only living Colpodæ are able to clear the emulsions.

"Direct sunlight does not prevent the clearing of the emulsions by the Infusoria, but temperatures below 10° C. and above 30° C. and absence of oxygen (anaerobic culture) are unfavorable to their exerting a bactericidal effect.

"The polluted water of the canals of Amsterdam slightly delayed the clearage of the emulsions; the sewage of starch factories and gas factories completely prevented this clearage.

"Consequently under natural conditions Infusoria will only play a part in purifying river water (1) if the temperature is above 10° and under 30° C., (2) if the aquatic vegetation is rich enough to supply the necessary quantity of oxygen, (3) if the water is not highly polluted by adjoining factories."

Sewage pollution of interstate and international waters with special reference to the spread of typhoid fever, A. J. McLaughlin (*Pub. Health and Mar. Hosp. Serv. U. S., Hyg. Lab. Bul. 83, 1912, pp. 296, charts 91, maps. 39*).—This report deals with Lake Superior and St. Marys River; Lake Michigan and the Straits of Mackinac; Lake Huron, St Lawrence River, Lake St. Clair, and the Detroit River; and Lake Ontario and St. Lawrence River. See also a previous report (E. S. R., 25, p. 720).

It is shown that "there is an undue prevalence of typhoid fever in many cities and towns in the drainage basin of the Great Lakes. This excessive prevalence of typhoid fever, especially in the winter and spring months, is due in greatest measure to sewage pollution of interstate and international waters used as a source of public water supplies. Given the sewage pollution of the source of supply, the excessive prevalence is made possible by the use of such water unfiltered and untreated or by the faulty operation or poor efficiency of filter plants. Most of the cities with excessive prevalence of typhoid fever use unfiltered surface water as a public supply, although disasters have occurred where inefficient filtration was being depended upon to make a polluted water safe."

The suggested remedy for the conditions described is, therefore, the substitution of carefully filtered or treated supplies "for the present polluted or dangerous public supplies where adequate protection of such supplies against pollution is not feasible." Specific advice is given on this point.

The Berlin sewage farms (43,009 acres), H. A. Roechling (*Jour. Roy. Sanit. Inst., 33 (1912), No. 5, pp. 178–206*).—This is a more detailed account of the work of these farms during the year ended March 31, 1910, than that previously noted (E. S. R., 26, p. 317). An important practical fact emphasized in the article is that in addition to efficiently purifying the sewage the farms paid a net profit of $2.66 per million gallons of sewage handled.

Irrigation with sewage (*Engin. Rec., 65 (1912), No. 3, pp. 82, 83*).—A plea is made for better utilization of the fertilizing matter of sewage, and the general proposition is advanced that better results from an economic standpoint could be obtained by quick handling of fresh sewage in a large number of small plants rather than by one large plant involving more or less decomposition and loss of fertilizing matter in the sewage. In an editorial, commenting on this proposal, the practical difficulties in the way of utilization of sewage for fertilizing purposes are concisely stated.

The struggle with sewage sludge, W. Naylor (*Surveyor, 41 (1912), No. 1064, pp. 818–821, fig. 1*).—The article reports a number of analyses of sludge and discusses its value as fertilizer, more particularly certain recently proposed methods for preparing the sludge in improved form for this purpose.

The most important improvement brought about by these methods is the reducing of the sludge to a light friable material free from excessive water

and grease, especially the latter. Analyses by the author of several samples of sludge show grease varying from 2.2 to 20.7 per cent on the basis of dry matter; also phosphoric acid from 1 to 6.3 per cent, and nitrogen from 0.8 to 3.8 per cent. Various processes of removing the grease are described, preference being accorded to the so-called Ekenburg wet carbonizing process originally designed for wet distillation of peat.

SOILS—FERTILIZERS.

Soils of the eastern United States and their use, XXXVI–XXXVII, J. A. Bonsteel (*U. S. Dept. Agr., Bur. Soils Circs. 63, pp. 16; 64, pp. 12*).—These circulars discuss 2 soil types with respect to geographical distribution, characteristics, surface features and drainage, use, improvement, and crop adaptations.

Circular 63 discusses the Volusia silt loam, of which a total of 821,184 acres have been surveyed and mapped by the Bureau of Soils. It "is an extensive type of soil developed at the higher altitudes in the glaciated northern portion of the plateau country which extends westward along the New York and Pennsylvania line from the vicinity of the Delaware River to the northeastern part of Ohio." The surface drainage is fairly well established, but "the internal drainage of the subsoil is poor over considerable areas, and numerous springs give rise to small swampy areas even upon some of the steeper slopes. Tile drainage is one of the chief requisites to the better farming of large areas of this soil." Oats, buckwheat, potatoes, and grass for pasture and hay are the principal crops. Corn is grown successfully only at the lower elevations except for silage, in which case it may be grown at higher altitudes, the flint varieties being best adapted.

Circular 64 discusses the Hagerstown clay, of which a total of 371,290 acres in 12 different areas in 7 States have been surveyed and mapped. This type "is an extensive limestone valley soil occurring throughout the valleys of the Appalachian Mountain region and of the blue-grass region of Kentucky. The soil is particularly well suited to the production of wheat and grass, and upon properly tilled areas corn is also an important and profitable crop. The topography of the type is usually rolling and sloping and the natural surface drainage is good."

The soils of Prince George's County, J. A. Bonsteel (In *The Physical Features of Prince George's County. Baltimore: Md. Geol. Survey, 1911, pp. 151–184*).—This report was prepared under the supervision of the Bureau of Soils of this Department and describes the agricultural conditions, geological relationships, and physical and chemical characteristics of the leading soil types of the county.

The entire area, excepting a small part covered by the Cecil mica loam, lies within the Coastal Plain region of the State. The most important soil types are the Leonardtown loam, Susquehanna gravel, Windsor sand, Westphalia sand, meadow, Norfolk sand, Collington sandy loam, Susquehanna clay, and the Susquehanna clay loam, all "derived from the unconsolidated sediments belonging to the mesozoic and cenozoic portions of the geological column."

"The great variety of soils found in the county, the moderate climate and general healthfulness of the greater part of the county, its accessibility by rail and by water, all favor a greater specialization of agriculture and increased profits from the cultivation of the soil."

Has the fertility of land in India decreased? B. Coventry (*Agr. Jour. India, 7 (1912), No. 1, pp. 45–54*).—This article gives in synopsis form the replies of the agricultural directors of the various provinces of India to the question as to the relative fertility of agricultural land at present as compared with former

times. It is concluded that although there is no statistical evidence to show what change has taken place the reports would indicate that the fertility of Indian soils has been more or less in a stationary condition with a tendency to improve under better treatment. The low rate of production in India as compared with western nations is attributed mainly to the small amount of capital employed.

Modern soil investigations, K. O. BJÖRLYKKE (*Tidsskr. Norske Landbr., 1912, No. 2, Sup., pp. 60*).—A lecture delivered in January, 1912, being a general discussion of soil problems, the methods of soil investigations adopted in Germany, Hungary, Bohemia, France, England, and the United States, and the history of soil studies in Norway. A chapter on simple practical methods of investigation of soils is included at the close of the pamphlet.

On the degree of consistency and stiffness in soils, A. ATTERBERG (*K. Landtbr. Akad. Handl. och Tidskr., 51 (1912), No. 2, pp. 93–123, figs. 21*).—The author's method of classifying soils according to their physical characteristics as regards plasticity and firmness is given. Two forms of apparatus for the determination of firmness and plasticity figures are described and the results obtained are discussed for purposes of soil classification. See also a previous note (E. S. R., 26, p. 220).

Corrections in physical science, D. L. NARAYANA RAO (*Hyderabad, Deccan, India, 1912, pt. 1, pp. 17; pt. 2, The Rationale of Agriculture, pp. 31*).—These pamphlets deal particularly with physical factors controlling soil moisture and the relation of tillage operations thereto. Attention is called to the fact that soils have in many cases been shown to lose much more water by evaporation and transpiration from plants than is supplied by precipitation, an apparent yearly deficit of about 25 in. from the earth's surface being generally admitted. The author maintains that the deficit is supplied and proper moisture conditions maintained in the soil not by capillary rise from below, for "there is no such thing as capillarity" as the term is generally understood, but by absorption of aqueous vapor from the air which penetrates and permeates the soil in a so-called process of "breathing."

"For the vapor to be properly caught or for allowing every individual soil grain to breathe well, the grains or particles must present to the air as much of their surfaces as possible at the same time touching each other gently on all sides. It is only then that perfect breathing of soils takes place. Where such breathing is going on in nature the soils are highly fertile and centuries of constant cultivation are unable to exhaust their fertility. I can quote as instances almost all the new formations by geological actions. They are most fertile. Nature is always digging and plowing and draining and making new soils. The breathing of the earth is the greatest geological force in nature."

The moisture content of packed and unpacked soils, F. T. SHUTT (*Canada Expt. Farms Rpts. 1911, p. 172*).—Further observations (E. S. R., 24, p. 421) on the effect of subsurface packing in conserving soil moisture showed no very great advantage from this practice, although it appeared that the packed land started the season with slightly more moisture than that which had not been so treated.

Soil tank investigations, A. W. BLAIR (*Florida Sta. Rpt. 1911, pp. XXXII–XXXIX, figs. 4*).—Experiments on the effect of different combinations of fertilizers on the growth and health of orange trees growing in tanks at the station (E. S. R., 25, p. 427) are reported, with measurements of rainfall, determinations of moisture in the tank soils, and analyses of the drainage from the tanks and of soils from a number of orange groves.

The experiments have not proceeded far enough to give conclusive results. It appears to be clearly indicated, however, that the soils of orange groves are

likely to lose nitrogen rapidly and hence to be deficient in this constituent. The tank soils lost nitrogen, mostly nitrates, in the drainage at the rate of 910½ lbs. of sodium nitrate per acre from July 7 to May 23. The surface soil of the orange groves examined contained only about one-half as much nitrogen as that of virgin hammocks. The loss of phosphoric acid and potash in the drainage of the tanks was much smaller than that of nitrogen, and there was less difference in this respect between virgin and the orange-grove soils.

A study of alkali soils, E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul., 2 (1912), No. 4, pp. 55–58*).—The results of determinations of alkali salts in soils upon which the oat crop showed marked difference in productiveness are reported, and correlated with crop yields in pot experiments with oats, timothy, and alfalfa with and without additions of gypsum and blood to the soil.

From the results of the analyses it is estimated that the poor soils contained 173,580 lbs. of water-soluble alkali salts per acre to a depth of 2½ ft. as compared with 18,600 lbs. in the good soils. The sodium carbonate content, however, was lower in the poor soils. Applications of gypsum gave slightly increased yields with oats and timothy. Blood also acted very favorably with these crops. In view of the fact that the soils were already well supplied with nitrogen it is believed that the beneficial effect of the blood may have been due to the incorporation with the soil of nitrifying organisms. Alfalfa was not benefited by the addition of either gypsum or blood.

Plant food lost in drainage from uncultivated peat soils and from such soils growing different crops, H. VON FEILITZEN ET AL. (*Svenska Mosskulturför. Tidskr., 26 (1912), No. 2, pp. 111–154, figs. 4*).—The results of 5 years' lysimeter trials at the Jönköping Experiment Station are reported.

Eight cement boxes (15 by 80 cm., 50 cm. deep) were placed in the ground and connected with bottles for collection of drainage waters. Each lysimeter was filled with about 94.5 kg. (about 207.9 lbs.) of a good quality of peat soil, containing about 60 per cent organic matter, 0.78 per cent lime, 0.66 per cent potash, 0.13 per cent phosphoric acid soluble in 12 per cent cold hydrochloric acid, and 2.15 per cent nitrogen. Two of the lysimeters were left unfertilized, while applications of superphosphate, superphosphate and 37 per cent potash salts, or the latter fertilization with nitrate of soda, were made to two lysimeters each. The amounts of fertilizers applied each year are given and the crops grown during the years 1906 to 1909, viz, oats, potatoes, and ruta-bagas. During the first year the soil lay fallow in all lysimeters. Complete data are presented as to amounts of precipitation, drainage water, and plant food (lime, potash, phosphoric acid, and nitrogen) removed in the drainage water and in the crops during each year. Analyses of the soil in all lysimeters in three different depths were made at the conclusion of the trials. The results obtained are discussed in some detail.

During the first year (fallow) considerable lime, nearly as much potash, and considerable nitric nitrogen were washed out, while the loss of phosphoric acid was insignificant. The losses were most marked in the case of the fertilized soil. During the 4 years when crops were grown on the soil the losses of lime were likewise largest, with potash and nitrogen following in the order given; the losses of phosphoric acid were small and of no practical importance. Much larger losses were sustained for lime and nitrogen on the unfertilized than on the fertilized soil, owing to the smaller crops grown thereon, while the losses for potash were about the same in all cases. The losses on the grass plats were considerably smaller than for the other crops. The soil analyses showed that in spite of the fertilizer applied the contents of lime, potash, and nitrogen were diminished during the 5 years' experimental period, while that

of phosphoric acid increased. The decrease was, however, small in proportion to the total amounts of the ingredients in the soil.

Regarding humus acids of Sphagnum turf, S. ODÉN (*Ber. Deut. Chem. Gesell., 45 (1912), No. 4, pp. 651–660; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 7, p. 350; Chem. Abs., 6 (1912), No. 16, pp. 2275, 2276*).—The author first reviews briefly different conceptions regarding the nature of humus acids, particularly as regards the question whether the reaction between alkali and humus acid results in a peptonization of the colloidal material or in a chemical precipitation of noncolloidal alkali compounds. He then describes a method of preparing solutions of ammonium humate free from colloids and from it, by precipitation with hydrochloric acid, humic acid in suspension free from salts, and reports studies of the reaction changes between humic acid suspensions and alkali solutions as determined by conductivity measurements.

The results of such measurements show that the interactions between ammonia solutions and humus acid really resulted in salt formation. The neutralization of sodium hydroxid with humic acid gave an equivalent of the acid of about 339. It appeared that humic acid is probably tribasic with a molecular weight of about 1,000. Purified humic acid when dried at 100° C. was converted into a hard mass which formed a black, lustrous powder. This powder did not go into suspension in water and was not soluble in alkali solutions immediately, but when treatment (with sodium hydroxid) was prolonged it gradually passed into solution yielding a brown liquid.

The influence of carbon upon nitrification, H. W. CLARK and G. O. ADAMS (*Jour. Indus. and Engin. Chem., 4 (1912), No. 4, pp. 272–274*).—Experiments are reported which showed that the addition of easily assimilable carbohydrates like sugar and molasses to sewage filter beds checked nitrification but at the same time tended to clear the beds of organic matter.

The present status of soil inoculation, K. F. KELLERMAN (*Centbl. Bakt. [etc.], 2. Abt., 34 (1912), No. 1–3, pp. 42–50, pls. 2*).—This is the full text of a paper of which an abstract has already been noted (E. S. R., 26, p. 520). An annotated bibliography of American studies on the subject is appended to the article.

Azotogen, nitragin, and natural inoculating soil, A. KÜHN (*Centbl. Bakt. [etc.], 2. Abt., 30 (1911), No. 21–24, 548–552*).—The author takes exception to the conclusions of von Feilitzen (E. S. R., 25, p. 123) regarding the relative efficiency of azotogen and nitragin.

Azotogen, nitragin, or inoculating soil, E. TEISLER (*Centbl. Bakt. [etc.], 2. Abt., 34 (1912), No. 1–3, pp. 50–56*).—The relative merits of these materials for inoculating purposes are discussed on the basis of the work of von Feilitzen (E. S. R., 25, p. 123), A. Kühn (see above), and others.

Inoculation experiments with nitragin for legumes, F. T. SHUTT (*Canada Expt. Farms Rpts. 1911, pp. 174–176*).—As in previous years, there was no material benefit from the use of this material.

Nitrogen enrichment of soils through the growth of clover, F. T. SHUTT (*Canada Expt. Farms Rpts. 1911, p. 173*).—Further observations on this subject (E. S. R., 22, p. 321) showed that the soil continues to increase in nitrogen under this treatment.

The increasing of the ammonia fixing power of soils under the influence of calcium carbonate, O. LEMMERMANN and L. FRESENIUS (*Fühling's Landw. Ztg., 61 (1912), Nos. 7, pp. 240–253, fig. 1; 8, pp. 274–285*).—It was found in these experiments that the addition of calcium carbonate to soil in pots to the extent of 1 per cent reduced the volatilization of ammonium carbonate and increased the absorptive power of the soil for ammonia. Caustic lime had the

opposite effect. Calcium sulphate and chlorid reduced loss solely by their direct action on the ammonium carbonate.

The chlorid was the only salt of magnesium which reduced loss of ammonia. Potassium and sodium chlorids, sulphates, and carbonates, as well as kainit and Thomas slag, reduced the absorptive power of the soil. Treatment with alcohol was without effect. On the other hand steaming, and especially igniting, had a marked effect.

The effect on absorption was dependent not only upon the bases but upon the nature of the acids with which they were combined. The absorptive power of the soil appears to be dependent mainly upon the exchange of bases in the zeolite compounds. The more rapid the aeration the greater was the loss of ammonia. The character of the soil exerts a great influence not only on the absorption of ammonia but on the action of lime on the absorption, rendering the addition of lime favorable, unfavorable, or without effect. See also previous notes (E. S. R., 21, p. 417; 26, p. 320).

The active potash of the soil and its relation to pot experiments, G. S. Fraps (*Texas Sta. Bul. 145, pp. 39, figs. 3*).—The results of studies of the active potash in soils as measured by the solubility in fifth-normal nitric acid are reported, and the analytical data compared with crop yields in pot experiments with different crops on a large number of Texas soils. During the course of the work a study was made of the solubility of potash of a number of minerals which may be present in the soil. The method of conducting the pot experiments was substantially the same as that employed in studies of the active phosphoric acid (E. S. R., 23, p. 423). The author summarizes his results as follows:

"The potash of nephelite, leucite, glauconite, biotite is completely extracted by strong hydrochloric acid. About one-third of the potash of muscovite is extracted and only a small percentage of the potash of microcline and orthoclase. Practically no potash is removed from orthoclase and microcline by fifth-normal nitric acid, less than 10 per cent from glauconite and biotite, and from 15 to 60 per cent from muscovite, nephelite, leucite, apophyllite, and phillipsite.

"Potash dissolved by fifth-normal nitric acid from soils represents a portion of the potash in the easily decomposed minerals. From 36 to 100 per cent of the potash absorbed from aqueous solution by certain minerals was extracted by fifth-normal nitric acid. Two per cent ammonia dissolved from 9 to 45 per cent of the potash absorbed by minerals.

"The potash extracted represents the difference between the potash dissolved and that fixed from the solution. The fixation of potash from fifth-normal nitric acid is much less than the fixation of phosphoric acid from the same solvent. The potash extracted from the soil by successive treatments with fifth-normal nitric acid at first represents easily soluble potash, and is finally reduced to the small amount of potash dissolved from highly insoluble minerals. Increasing the quantity of potash mineral to a fixed amount of solvent increases the quantity of potash extracted, but the percentage of the potash extracted decreases.

"The quantity of potash extracted by fifth-normal nitric acid below 50 parts per million represents 1 to 2 per cent of the potash of highly insoluble silicates. The quantity extracted in excess of approximately 50 parts per million represents a comparatively large percentage of a much smaller quantity of more easily soluble potash.

"The potash extracted by fifth-normal nitric acid from the soil is not necessarily in the same form of combination in different soils and does not necessarily have the same value to plants. . . .

"The percentage of crops which show an increase in growth caused by the addition of potassium fertilizers, decreases from 86.7 with soils containing less than 50 parts per million of active potash to zero in soils containing 800 to 1,000 parts per million of active potash. The effect of the potash decreases with the active potash in the soil.

"The percentage of crops injured by the potash increases with the quantity of active potash in the soil.

"The effect of the addition of potash to the soil upon the average weight of the crop in the pot experiments decreases with the quantity of the active potash in the soil. When the soil contains more than 200 parts per million of active potash, addition of potash does not increase the average weight of the crop, but often decreases the crop.

"The average percentage of potash contained in 235 crops increased with the percentage of active potash in the soil. The average quantity of potash removed from the soil by the crops increases with the quantity of active potash in the soil. Relatively enormous quantities of potash are removed by the crops in these pot experiments. Expressed in terms of bushels of corn equivalent to the potash removed, the quantity averaged 58.6 bu. in soils containing less than 50 parts per million of active potash and 413.8 bu. in soils containing 600 to 800 parts per million.

"Deficiency of plant food is a relative term and depends upon the growth which can be made under the conditions of the experiment. Soils containing less than 50 parts per million of active potash were deficient in 87 per cent of the pot tests and the average crop without potash is 67 per cent of that with potash, and yet these soils gave up enough potash to the crop to produce 58 bu. corn to the acre, on the average.

"There is a loss of active potash consequent upon the cropping of the soil. The loss is approximately one-half of the potash taken up by the plant when the active potash exceeds 100 parts per million. When the active potash is between 50 to 100 parts per million, the loss is about one-fifth of the potash taken up by the plant. When the active potash is about 50 parts per million or less, there may be no observed loss."

The feeding of plants with mineral matter through the leaves, L. HILTNER (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 10 (1912), No. 1, pp. 6, 7, fig. 1; Deut. Obstbau Ztg., 1912, No. 7, pp. 143, 144, fig. 1*).—A brief account is given of the growing of rape plants in sterile sand practically free from potash, certain of the plants receiving no application of potash while in other cases a 2 per cent solution of potassium sulphate was painted upon the leaves from time to time but no potash was applied to the soil. The plants grown in sterile sand without potash made practically no growth while those on which the potash solution was applied to the leaves grew and matured normally.

Results of cooperative fertilizer tests on clay and loam soils, J. B. ABBOTT and S. D. CONNER (*Indiana Sta. Bul. 155, pp. 99–132, figs. 7*).—During the past 8 years about 225 cooperative fertilizer tests on clay and loam soils have been undertaken by the station, mainly with corn and wheat, but also including oats, potatoes, canuery tomatoes, and one or more experiments with each of 15 other crops of less general importance. Such of the results of the corn, wheat, oats, potato, and tomato experiments as are deemed of value, one timothy experiment, and a few miscellaneous experiments, are included in this bulletin.

The results of these experiments are summarized as follows:

"In the corn fertilization experiments, complete fertilizer gave the largest average increase, but phosphoric acid and potash gave the largest average profit. In the amounts used on corn, nitrogen caused a small average increase and was used at a loss, potash caused a larger average increase and was used

at a profit, and phosphoric acid caused the largest average increase and was used at the greatest average profit per acre.

"In the wheat fertilization experiments the complete fertilizer gave the largest average increase, and the greatest average profit per acre. In the amounts used on wheat, each element was profitable, and they stood in the same order of importance as in the corn fertilization experiments. The use of 200 lbs. of fertilizer per acre on wheat proved more profitable than the use of 100 lbs. per acre.

"Phosphoric acid and potash gave a greater profit, per dollar invested in fertilizer, than complete fertilizer, on both corn and wheat. Fertilizer gave a greater average profit per acre on wheat than on corn, and was profitable in a much larger percentage of the experiments.

"Fertilization increased the yield of oats about the same number of bushels per acre as in the case of wheat.

"In the potato fertilization experiments, complete fertilizer gave the greatest average increase, but the amount used was apparently too large to give the greatest immediate profit. The formula used for potato fertilization, 4:8:10, was found to be relatively too low in phosphoric acid content in proportion to nitrogen and potash. In the amounts used for potato fertilization, nitrate of soda was not as effective as dried blood. Muriate and sulphate of potash were equally effective in increasing the yield, but in some cases sulphate produced potatoes of better quality.

"In the tomato fertilization experiments, complete fertilizer gave the largest average increase and the largest average profit. It was more profitable to use 500 lbs. of fertilizer per acre on tomatoes than to use 250 lbs. per acre. Nitrogen derived partly from nitrate of soda and partly from dried blood gave better results on tomatoes than nitrogen derived wholly from dried blood, or wholly from nitrate of soda. Fertilization of tomatoes in the hill gave better results than broadcast fertilization.

"The use of complete fertilizer gave better results on timothy than the use of nitrate of soda alone, particularly the second year.

"Nitrogen derived from peat was not as effective as nitrogen derived from dried blood in any case. The purchase of nitrogen in large amounts for corn and wheat fertilization did not prove profitable.

"Heavy applications of fertilizer showed a lasting effect comparable to that of manure. Rock phosphate did not give appreciable results until the second year after application.

"In nearly all experiments with all crops on clay and loam soils phosphoric acid was found to be the most effective of the fertilizer elements."

The fixation of atmospheric nitrogen by the use of aluminum nitrid, F. MARBE (*Génie Civil, 61 (1912), No. 2, pp. 30–33; Engrais, 27 (1912), No. 21, pp. 577–581; abs. in Chem. Abs., 6 (1912), No. 15, p. 2130*).—The history, theory, and the practical operation of this method of fixation of free nitrogen are discussed. The process is of special agricultural importance because of the high nitrogen content (33 to 35 per cent) and cheapness of production of the nitrid. Its direct action as a fertilizer has, however, not been fully investigated.

On phosphoric acid fertilization and its importance in moor culture, H. VON FEILITZEN (*Svenska Mosskulturför. Tidskr., 26 (1912), No. 2, Sup., pp. 64, figs. 30*).—A treatise on the subject, based largely on the results of recent investigations and practical experiences in the cultivation of moor soils. The results show the predominant need of phosphatic fertilizers on these soils.

The fertilizing value of superphosphate, F. KLINKERFUES (*Zentbl. Kunstdünger Indus., 16 (1911), p. 376; abs. in Chem. Ztg., 36 (1912), No. 4, Repert., p. 19*).—The changes which phosphate undergoes in the process of treatment

with acid and during the "ripening" (and reversion) of the superphosphate on standing are discussed in relation to the availability of the phosphoric acid to plants. It is claimed that the "ripened" superphosphate is readily available and is less subject to leaching in the soil.

The use of phosphatic fertilizers in France, HITIER (*Bul. Soc. Encour. Indus. Nat. [Paris], 115 (1911), No. 6, pp. 848–855; abs. in Nature [London], 88 (1912), No. 2204, p. 429*).—The amount and character of phosphates used in France, as well as the factors affecting the price of phosphatic fertilizers during recent years, are discussed in this article.

It is shown that large amounts of basic slag and superphosphate, but little rock phosphate, are used in France. "More than a quarter of a million tons of basic slag are used annually on the grass land, especially where the soil is derived from granite and schists, while about one and a half million tons of superphosphate are used annually on the arable land, and a good deal of phosphate is also contained in the guano applied as fertilizer."

It is stated that the price of superphosphates has usually been lower in France than in England, but now that the French deposits of rock phosphate are giving out it is necessary to look elsewhere for supplies of this material, and the price is therefore increasing. At the same time the price of pyrites, from which the sulphuric acid used in the manufacture of superphosphates is made, has also increased.

Discussing the effect of phosphates on the quality as well as the quantity of farm products, it is pointed out that Müntz has shown that dairy products, particularly butter of the finest quality, are obtained only from pastures exceptionally rich in phosphates, and that Paturel has shown a clear connection between the quality of wine and the supply of phosphates.

The production of phosphate rock in 1911, F. B. VAN HORN (*Amer. Fert., 36 (1912), No. 11, pp. 21–28*).—In 1911 the total marketed production was 3,053,279 long tons, valued at $11,900,693, as compared with 2,654,988 long tons, valued at $10,917,000, in 1910. "This increase was almost entirely in Florida land pebble, though Tennessee also showed a good gain. The average price of all rock showed a falling off, being $3.90 in 1911, as compared with $4.11 in 1910."

The business aspect of the kelp proposition, F. P. DEWEY (*Jour. Indus. and Engin. Chem., 4 (1912), No. 4, p. 311*).—This article emphasizes especially the difficulty and cost of gathering and drying the kelp in the preparation of potash salts from this source. Assuming the possibility of in time reducing the cost of gathering to 25 cts. per ton and of air-drying to 15 cts. per ton, and that the iodin will pay the cost of all operations on the air-dried kelp, it is estimated that a ton of potassium chlorid from kelp will cost, laid down on the Atlantic coast, $28.

Potash lime, its preparation and use in agriculture, MÖLLER ET AL. (*Deut. Zuckerindus., 37 (1912), No. 22, pp. 481–483*).—Experiments on beets and oats with this material, which is prepared by treating lime with the waste solution from the manufacture of potash, and which contains according to the analysis reported about 48 per cent of lime and 1.4 per cent of potash, are briefly reviewed, indicating a decided fertilizing value. See also a previous note (E. S. R., 26, p. 526).

Carriers of lime, J. W. AMES (*Ohio Sta. Circ. 123, pp. 135–142*).—"A general description of the several forms and of the by-product materials containing lime is presented in this circular."

Sulphur as a fertilizer, A. HERAUD (*Petite Rev. Agr. et Hort., 18 (1912), No. 419, pp. 112, 113*).—This is a brief article based upon the experiments of Chancrin and Desriot (E. S. R., 25, p. 519), Boullanger (E. S. R., 27, p. 27), Demolen

(E. S. R., 26, p. 819), and Degrully, indicating a distinct fertilizing effect of sulphur.

Some results obtained from the use of catalytic fertilizers, G. Bertrand (*Bul. Assoc. Chim. Sucr. et Distill., 29 (1912), No. 10, pp. 681–688*).—Plat experiments with various crops indicated beneficial effects from the use of manganese compounds. Aluminum nitrate and sulphate and boric acid were also tested to a limited extent but without decisive results.

Argentina guano, F. P. Marotta (*Rev. Indus. y Agr. Tucumán, 2 (1912), Nos. 8, pp. 364–374; 9, pp. 399–409*).—This guano is shown to be low grade, containing only 1.13 per cent of nitrogen and 1.11 per cent phosphoric acid. Its composition is compared with that of guanos from many different sources.

Fertilizing value of sewage sludge at Madison, Wisconsin (*Engin. and Contract., 36 (1911), No. 16, pp. 408, 409*).—An analysis of dried sludge from the sewage disposal works of this city is reported, showing moisture 1.61, nitrogen 2.23, phosphoric acid 0.67, and potash 1.76 per cent. It is estimated that this sludge has a fertilizing value of $8 per ton.

Commercial fertilizers, W. J. Jones, Jr., et al. (*Indiana Sta. Bul. 156, pp. 135–232, fig 1*).—This bulletin summarizes the Indiana fertilizer law, discusses the fertilizer trade in the State and the results of inspection, and reports analyses of fertilizers examined during 1911 as compared with those of previous years.

It is estimated that the sales of fertilizers in the State in 1911 amounted to 179,839 tons valued at $4,352,269.27. There is shown to be an extension of the use of fertilizers in the State and a growing tendency to use high-grade fertilizers, to purchase on the plant-food basis, and to use more potash and fine-ground phosphate. The quality of the fertilizers offered for sale were the best since the amended fertilizer law went into effect.

A list of firms offering raw materials for home mixing is given.

Commercial fertilizers, B. H. Hite and F. B. Kunst (*West Virginia Sta. Bul. 138, pp. 229–273*).—This bulletin reports the results of analyses of commercial fertilizers inspected during the year 1911. The report shows "very few really serious failures to use materials of the quality guarantied.

Fertilizing materials, F. T. Shutt (*Canada Expt. Farms Rpts. 1911, pp. 183–198*).—Analyses of ground rock, limestones, lime, marl, gypsum, mud, muck, peat, crematory ashes, soot, wheat straw ash, seaweed, and dogfish scrap are reported and discussed.

An act to regulate the sale of commercial fertilizers (*Massachusetts Sta. Circ. 32, pp. 4*).—This is the text of the law approved May 4, 1911. The principal new features of this law as compared with the old are provisions for inspection of agricultural lime; for guaranty of available phosphoric acid in Thomas slag by the Wagner method; an analysis fee of $8 instead of $5 each for nitrogen, phosphoric acid, and potash in fertilizers, and $12 for agricultural lime; registration and payment of fee on or before January 1 instead of May 1; and the retention of duplicate samples by the station for one year.

The American fertilizer handbook, 1912 (*Philadelphia, 1912, pp. 306, figs. 19*).—This is an up-to-date compendium of useful information regarding the fertilizer business, including directories of the fertilizer trade and allied trades, as well as a review of patents relating to the production of fertilizers from 1830 to 1910, and special articles on the following subjects: The National Fertilizer Association; phosphate rock deposits of the United States and statistics of production, consumption, and price of phosphate rock; statistics of production, consumption, and price of potash salts, nitrate of soda, sulphate of ammonia, tankage and blood, and cotton-seed meal; the construction of a modern fertilizer

factory; reviews of the fertilizer materials markets in the United States and statistics of the consumption of fertilizers in the United States as a whole and in the different States; statistics of farm expenditures for fertilizers; the home mixing of fertilizers; a list of the state fertilizer controls; and numerous useful tables giving conversion factors, temperature corrections for hydrometer readings of sulphuric acid, fertilizer formulas, etc.

The world's consumption of fertilizers (*Rev. sci. [Paris]*, *50 (1912)*, *I, No. 1, pp. 22, 23*).—This is a brief note on statistics published by Schneider elsewhere.

The figures are for 1908 and indicate the production in that year of 10,000,000 metric tons of phosphatic fertilizers, the greatest consumers of which were, in the order named, Belgium, Germany, Italy, and France; potash fertilizers corresponding to 500,000 tons of pure potash, the order of consumption of which by countries was Germany, Belgium, United States, France, and Austria; and nitrogenous fertilizers, including both sodium nitrate and ammonium sulphate, 2,500,000 tons, the order of consumption by countries being Belgium, Germany, England, France, and Italy.

Mineral fertilizers in Spain (*Engrais, 27 (1912), No. 2, pp. 44–46*).—It is shown that the use of mineral fertilizers is increasing in Spain, especially in Catalonia, and in 1909 amounted to 292,436,874 kg. (321,680 tons) valued at 47,818,017 pesetas ($9,228,877.28). The larger proportion of the fertilizers used is imported from England, France, Belgium, and Germany. A few fertilizer factories have been established, of which three in Barcelona are of some importance.

Artificial fertilizer trade (*Daily Cons. and Trade Rpts. [U. S.], 15 (1912), No. 100, pp. 869–873*).—This is a brief review of the fertilizer trade in Russia, Denmark, Italy, China, Canada, and the West Indies.

AGRICULTURAL BOTANY.

A text-book of botany.—II. Ecology, J. M. Coulter, C. R. Barnes, and H. C. Cowles (*New York, Cincinnati, and Chicago, 1911, vol. 2, pp. X+485–964+a–q, figs. 535*).—This is the second and concluding volume of the text-book of botany from the Hull Botanical Laboratory of Chicago University (E. S. R., 24, p. 626). The plan outlined in the first volume has been maintained, the work being largely developed from courses in undergraduate study, though in the present volume the authors have included many recent observations and some new points of view.

This new text-book should prove especially adapted to the training of undergraduate students, as it contains the essentials for a foundation for work in almost any field of botany. The authors state that "it is not intended for reading and recitation," but it will doubtless prove suggestive to teachers and will aid students in correlating their observations with each other and with the known facts.

Types of British vegetation, edited by A. G. Tansley (*Cambridge, 1911, pp. XX+416, pls. 36, figs. 22*).—This book is the result of the work of the committee founded in 1904 to carry on a survey and study of British vegetation. An effort is made to recognize and describe the different types of plant community existing in the natural vegetation of the British islands, and to trace their relations to climate and soil and to one another. It is believed that the statements made about the relation of soils to the different types of vegetation, which are partly based on analysis and partly inferred, are essentially accurate and afford a sound basis of classification.

ations of temperature comparable to those outside. After varying periods of time portions of these lots were tested as to comparative power of germination in blotting paper, sand, and humus.

The treatment so far as tried showed favorable results, as compared with those from the exposed seeds, in preserving the viability of the seeds of the fir, oak, beech, and maple. The other seeds gave inconclusive or negative results.

The results of the germination of seed subjected to the action of various solutions, P. Lesage (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 13, pp. 826–829*).—A brief account is given of experiments with seed of the common garden cress to determine the effect of various solutions on germination. Seed were placed to germinate after soaking in varying strengths of alcohol for periods of from 1 to 50 hours.

The results show that in very concentrated solutions the seed retained their vitality to a considerable extent, while in more dilute ones they were destroyed. In still greater dilutions of alcohol no injury was noted.

A table is given showing the effect of treating seed in from 0.5 to 12.5 per cent solutions of absolute alcohol, the exposure varying from 1 to 50 hours. The strongest solution, even when employed for 50 hours, destroyed only 3 out of 10 seed, while after 6 hours in the 0.5 per cent solution none germinated and only 2 remained alive in the lot that was treated that long. For the 1 per cent solution none germinated after 3 hours' soaking, nor did any germinate after 2 hours' treatment in the 2 per cent solution, but as the strength of the solution was increased the period of soaking could be likewise increased without apparent injury.

The author discusses at length the curve which shows the relation between the strength of solution and the length of exposure, and thinks that possibly some data can be secured on the sterilization of seed without appreciably injuring their vitality. Other experiments are briefly noted in which cress and radish seeds were subjected to solutions of common salt and comparable curves were obtained.

The effects of caffein upon the germination and growth of seeds, F. Ransom (*Bio-Chem. Jour., 6 (1912), No. 2, pp. 151–161*).—Caffein in aqueous solutions, varying in strength from 1 to 0.0001 per cent, was applied to various seeds before planting in order to test its effects in retarding or stimulating germination and growth.

The results obtained quite uniformly attest the injurious effects of caffein. At 1 per cent concentration, germination was entirely prevented in some instances, and both germination and growth were greatly retarded by strengths as low as 0.01 per cent. The only exception, that in case of nasturtium, was ascribed to the density of the seed covering which was supposed to limit the access of caffein. More dilute solutions of caffein alone or in association with other substances had no perceptible accelerating effect. The investigations are being continued.

Water and light as factors in vegetation, T. Pfeiffer, E. Blanck, and M. Flügel (*Landw. Vers. Stat., 76 (1912), No. 3–6, pp. 169–236, figs. 4*).—These investigators carried out in the spring of 1910 a series of 112 experiments on the effects of water and light on growth products of oats, the more significant results of which may be summed up as follows:

The water content of the soil bears a more important relation to the formation of crop products than has yet received adequate recognition. The nitrogen content of the crop is increased with the addition to the soil of this nutritive substance. The establishment of maximum values for the profitable utilization of plant food is considered to be of importance as regards agricultural products. Self-shading through luxuriant growth interferes with the results of other

variant factors, preventing their full expression in augmented crops. The point where this interference begins is difficult to determine. The law of minimum is a straight line function only so long as optimal vegetative factors operate. Larger water utilization affects the relative solid content of crops negatively. About 364 gm. of water was used per gram of dry substance formed above ground.

Relation of the daily march of transpiration to variations in the water content of foliage leaves, B. E. Livingston and W. H. Brown (*Bot. Gaz., 53 (1912), No. 4, pp. 309–330*).—Attention was called in a previous publication (E. S. R., 18, p. 328) to differences existing between the time of the maximum evaporating power of the air and the maximum transpiration in certain plants. From a study of the relation of transpiration to variation in the water content of leaves the authors conclude that there can remain little question that green plants when subjected to relatively great diurnal evaporation intensity frequently exhibit a marked fall in foliar moisture content by day and a corresponding rise by night.

The experiments reported were made in Arizona and the authors were unable to compare the conditions with those of more humid and cooler regions. It is stated that, so far as evidence is at hand, it is probable that the cause of this diurnal minimum in foliar moisture rests in the phenomenon of incipient drying, brought about wherever the ratio of water loss to water supply in the leaves is rendered less than unity. Although the experiments would seem to indicate that the external factor which controls this diurnal fall of leaf moisture is evaporation intensity, the true controlling condition, the authors believe, is more probably the ratio of water supply to water loss. The structure of the plant, the moisture conditions of the soil, and the intensity of evaporation and of solar illumination appear to make up the controlling environmental complex.

It is thought probable that the diurnal, nonstomatal retardation of the escape of water vapor from green leaves in sunlight is the effect of a lower vapor tension within the internal atmosphere of the leaves and over their surfaces. This lower vapor tension is brought about by the increased surface tension and decreased evaporation surface which accompanies a lowered water content of the internally and externally exposed cell walls.

The authors think that in the diurnal minimum in the water content of foliage leaves a criterion can be established that may prove of importance to scientific agriculture, in arid regions at least. By this it may be possible to determine indirectly and somewhat simply the status of the water relations of the plant and to foresee the need of increased soil moisture long before the cessation of growth or actual wilting becomes manifest.

Stimulation movements of plants, E. G. Pringsheim (*Die Reizbewegungen der Pflanzen. Berlin, 1912, pp. VIII+326, figs. 96*).—This book is intended as an introduction to the study of the physiology of stimulation in plants, being somewhat more full than the treatment usually given in text-books but not so detailed and specialized as that found in more technical treatises. Free movement, protoplasmic streaming movements, growth and turgor movements, and the various tropisms receive separate and proportional discussion. The work concludes with a somewhat full bibliography and an index.

Nitrogen assimilation under sterile conditions of plants from nitrates, ammonium salts, and asparagin, G. G. Petrov (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscou), 17 (1911), No. 4, pp. 141–178, figs. 3*).—The investigator cultivated maize plants on nets suspended in sterile tubes in a stream of carbon dioxid over nutritive solutions of (1) calcium nitrate, (2) ammonium sulphate, and (3) asparagin. Both stalks and roots were analyzed, and determinations were made of the total nitrogen content, also of that found as

albumin, asparagin, and ammonia. On the basis of the findings from these experiments, in connection with the data of related literature, he reaches the following conclusions:

In the plant tissues the nitrates are reduced to ammonia during the oxidation of carbohydrates. The ammonia so produced taken on the forms of various amid compounds, in some parts, of asparagin; while that absorbed from outside passes over in large part into asparagin. Asparagin is absorbed by the plant and appears as a good source of nitrogen in this series of experiments.

The assimilation of nitrates in plant cells, O. Loew (*Chem. Ztg., 36 (1912), No. 7, pp. 57, 58*).—Considering the questions of (1) what is the first transformation product of the nitrates in the manufacture of protein and (2) what factors are operative in the reduction of such nitrates, the author takes the negative view as to the formation of hydroxylamin and the necessity for light as a source of energy for the reduction process. The results of several investigations are presented with his views, in brief as follows:

Previous experiments conducted, supervised, or cited by the author are claimed to show that (1) contact with platinum sponge is sufficient in the absence of light to reduce magnesium nitrate with glucose in an over-saturated solution of potassium hydrate or to reduce potassium nitrate in solution with dextrose; (2) here is a process analogous or similar to one that goes on in the living cell; (3) absence of light did not prevent, nor did access of light accelerate, the reduction of sodium nitrate in the development of *Penicillium glaucum* cultures in a nutrient medium with glycerin; (4) in various roots kept growing in a cool and totally dark chamber the nitrates were steadily decreased in quantity with corresponding increase of protein; and (5) in case of young etiolated barley plants kept 7 days in a nutrient solution containing 0.2 per cent of sodium nitrate, and then for an equal time in cane sugar solution, maintained at 10 per cent strength and at from 10 to 20° C. and half saturated with calcium sulphate, every trace of the nitrate disappeared from the plants in complete darkness with increase of protein, while the control plants showed strong nitrate reaction. It is held that (6) the light energy which breaks up nitric compounds, for example, nitric acid with evolution of nitric peroxid, has its parallel and equivalent in energy developed by the so-called intramolecular (anaerobic) respiration; (7) if hydroxylamin were formed from nitrates through reduction, its toxic influence upon cells, even in highly dilute solutions, would reveal its presence, the same being true also of some other suggested products; (8) the proteins of living cells are so labile that the least disturbance originates a series of changes which extend throughout the protoplasm; (9) the kinetic energy of the living protoplasm, lowering to more stable groupings, is sufficient for the more difficult work of reducing sulphates; and (10) most roots are obliged to utilize their nitrates in the absence of light and they are probably not carried to the leaves for reduction before utilization.

The physiological function of magnesia in green plants, L. Bernardini and G. Morelli (*Rend. Soc. Chim. Ital., 2. ser., 3 (1912), No. 13, pp. 349–353; Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 21 (1912), I, No. 5, pp. 357–362*).—In continuation of work previously noted (E. S. R., 21, p. 30; 22, p. 433), the authors here report their conclusion that magnesium probably plays an important rôle in plant development by its combining with phosphoric acid in the formation of both storage and utilization materials. This is said to be evidenced by the behavior of the chlorophyll in relation to changes in the magnesium phosphate and the germination of seeds in the presence of light.

Injurious effects of illuminating gas upon greenhouse plants, E. M. Wilcox (*Ann. Rpt. Nebr. State Hort. Soc., 42 (1911), pp. 278–285, figs. 11*).—A descrip-

tion is given of the injury to plants in greenhouses at Omaha, Nebr., which is attributed to the effect of gas from a break in a gas main across the street from the greenhouses. Carnations were particularly attacked, and some peculiar manifestations are described.

In the variety Scarlet Glow 3 weeks after the original injury the styles were found projected from the tips of the buds, which did not show any tendency to open. In other varieties the buds that had commenced to open remained closed and the calyx dried over the apparently dead corolla within. Flowers that were open at the time were killed outright.

Defoliation did not occur on carnations, although on many other plants this was the most characteristic symptom noted. Roses, coleus, and geraniums were more or less defoliated and the terminal shoots often destroyed. Considerable injury was noted on different varieties of lily as well as other plants. It is stated that carnation rust was much more abundant on plants subject to the injury than on others, and it is thought that the effect of the gas rendered them less resistant than normally to the attack of parasitic fungi.

The tarring of roads and its effect on the neighboring vegetation, C. L. GATIN (*Ann. Sci. Nat. Bot., 9. ser., 15 (1912), No. 2–4, pp. 165–252, pl. 1, figs. 12*).—As secretary of the commission appointed to investigate this subject, the author reports at length upon their investigations, experiments, and conclusions. A study was made of the different substances used for the surface treatment of roads, most of them having coal tar as a basis. The literature of the subject is reviewed, and the results of extended series of observations and experiments are given. Some of the features of the investigation have already been noted (E. S. R., 25, p. 128; 26, p. 432).

All the results tend to show that many trees, shrubs, garden plants, and flowers suffer injury from the fumes given off by the tar and also from the dust arising from the treated roads. The injury seems to be proportional to the distance from the road, the amount of travel, percentage of phenol in the compound, and the insolation of the plants. The effect on the plants is shown in the fading of the leaves, which are spotted and blackened. The cells are plasmolyzed, the chlorophyll disappears, and in its place are found drops of oil and tannin. The whole plant becomes stunted, the development of fibrovascular tissues is reduced, and the formation of reserve starch checked. Marked differences in resistance to injury on the part of some plants is noted, those with thick epidermal cells being less injured than others.

Chemical protection of plants against freezing, I, N. A. MAKSIMOV (*Ber. Deut. Bot. Gesell., 30 (1912), No. 2, pp. 52–65*).—From a series of experiments instituted by the author and not yet complete, preliminary conclusions are drawn in substance as follows:

The introduction of organic substances of nutrient character (carbohydrates, alcohols, acetone) into the plant cell may markedly heighten its resistance to cold, even in case of tropical plants. This protective effect is not in direct proportion to the osmotic pressure and the lowering of the freezing point; it is considerably more rapid than the latter change. Different substances protect in different degrees. The sugars stand highest; then come glycerin, the alcohols, and acetone; mannite stands very low in this scale. The removal of the protective contents restores the original degree of resistance.

A new method of cultivating some of the higher plants in sterile media, R. COMBES (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 14, pp. 891–893, figs. 2*).—The author illustrates and describes a form of apparatus devised for growing plants, in which the roots are kept in a sterile medium throughout the entire period of the experiment while the aerial organs remain free in the air.

FIELD CROPS.

[Field crops work at the Canadian experiment stations and farms in 1910]. W. SAUNDERS, J. H. GRISDALE, W. T. MACOUN, C. E. SAUNDERS, F. T. SHUTT, H. T. GÜSSOW, J. A. CLARK, R. ROBERTSON, J. MURRAY, A. MACKAY, W. A. MUNRO, W. H. FAIRFIELD, G. H. HUTTON, T. A. SHARPE (*Canada Expt. Farms Rpts. 1911, pp. 7–9, 21–24, 33, 34, 87–50, 84–109, 122–128, 131, 132, 143–159, 165–168, 177–181, 262–267, 272–274, 295–306, 317–333, 352–380, 397–413, 435–440, 443–474, 480–502, 505, 506, 511–519, pls. 5, figs. 2*).—This continues work already noted (E. S. R., 24, p. 432).

The various farms conducted variety tests of corn, oats, 2- and 6-rowed barley, spring, winter, and durum wheat, emmer, spelt, flax, spring and winter rye, millet, peas, grasses, clovers, mangels, turnips, carrots, sugar beets, potatoes, field peas, and field beans. Mixed sowings of peas and various small grains were also tested. Tables state the yields obtained in these tests and the more important cultural and varietal data obtained from some of them.

Dates of sowing and ripening in Alberta of varieties of spring wheat, oats, 2- and 6-rowed barley, peas, carrots, turnips, sugar beets, mangels, potatoes, and corn are reported in tables, together with yields and other data on the crops obtained.

Tables state some of the results of tests of 1,547 samples of wheat, barley, oats, rye, peas, beans, flax, grass, maple, and ash seeds from different Provinces. They were tested to determine the climatic conditions favorable to the production of seed of high vitality, and to test the influence of the character of the season on vitality. Tests of the decrease of vitality of grains through age indicated that the loss is retarded by low temperature. Winter wheat retained a high germinating power longer than spring varieties, but after the sixth year the specimens in both warm and cold storage had almost entirely lost their germinating power. The decrease was striking in the fourth year, and still more marked in the fifth year. Oat varieties showed fairly good vitality for 5 years, but were quite low in the sixth and seventh years.

The results of rotation and fertilizer tests are tabulated as in previous years. The corn, oats, clover hay rotation again gave the highest profit, $9.34 per acre.

Potato spraying and change of seed experiments gave results in harmony with those of previous years. Seed of 11 varieties grown at Indian Head produced yields averaging 368 bu. 30 lbs. per acre, as compared with 96 bu. and 42 lbs. secured from Ottawa-grown seed of the same 11 varieties.

In the sixth year's work on the effect of soil moisture on the composition of grain it appeared that irrigated barley had a low protein content as compared with that from dry farming plats. Wheat was probably less affected in this particular.

Analyses of turnips, mangels, and sugar beets are reported. Eleven years' analyses of 2 varieties of mangels indicate that their composition is largely controlled by heredity, as the relative position of the 2 varieties always remained unchanged. Among 11 varieties of turnips tested at the Prince Edward Island station, 55 per cent of the roots of Magnum Bonum were affected by club root as compared with from 73.5 to 100 per cent in case of the other varieties.

At the Nova Scotia farm, the addition of 300 lbs. of artificial fertilizers per acre to manure applied to each of a number of turnip varieties gave financial returns ranging from losses of $4.56 to a gain of $1.84 per acre as compared with returns obtained from the plats which received only the manure. Similar tests with mangels showed gains ranging from 44 cts. to $6.60 per acre.

Wheat grown at the Brandon farm from smutty seed treated with either formalin or bluestone by sprinkling or dipping was entirely free from smut.

while the untreated seed produced a crop with 19 per cent of the heads smutted. Home-grown seed of 1 variety of mangels produced over 1½ times as great a crop as did commercial seed of the same variety, but there was little difference in case of another mangel variety and 2 turnip varieties.

At the Indian Head farm an unpacked acre produced 1 bu. 32 lbs. more peas than did soil packed once with subsurface packer. The oat yield was apparently raised from 81 bu. 21 lbs. to 88 bu. 17 lbs. by packing once, and the barley yield from 64 bu. 28 lbs. to 69 bu. 28 lbs. Barley on soil packed twice yielded over a bushel less than on soil packed only once. The first year's results of a series of rotation tests on summer fallowed land are reported.

On the nonirrigated farm at Lethbridge, land harrowed April 9 yielded 18 bu. 48 lbs. of winter wheat per acre as compared with 16 bu. 15 lbs. on that not harrowed. Wheat sown September 1 and 15 produced heavier yields than that sown on other dates ranging from July 15 to December 1. Sowing at the rate of 75 lbs. per acre resulted in a higher 3-year-average yield than did any of the 7 other rates tested ranging from 15 to 120 lbs. In case of spring wheat 105 lbs. gave the highest 3-year-average yield. From 60 to 105 lbs. of oats and from 75 to 105 lbs. of barley appeared to be the best rates of sowing. Higher potato yields followed planting in rows 2½ or 3 ft. apart than 3½ or 4 ft. apart, and 2 ft. apart in the row invariably excelled 1 ft. apart.

On the irrigated farm at Lethbridge, in rate of seeding tests, the highest 3-year-average yields followed sowings of from 75 to 105 lbs. of spring wheat, from 90 to 105 lbs. of oats, and from 45 to 60 lbs. of barley. Alfalfa seeded at the rate of 10 lbs. per acre produced about the same yield as when sown at higher rates up to 30 lbs. per acre. Spring and fall irrigated winter wheat yielded 18 bu. 5 lbs. and 21 bu. 40 lbs. per acre, respectively. A mixture of alfalfa, timothy, and rye grass produced a little higher 2-year-average yield than a mixture of alfalfa and rye grass, and about 0.8 ton per acre more than a mixture of alfalfa and timothy. Soil-inoculated clover produced more than twice as much as that not inoculated and over 1½ times as much as that inoculated with a laboratory culture.

At the Lacombe farm, in 1910, the highest yield obtained in rate of sowing tests followed sowings of 2 bu. of winter wheat, 2¾ bu. of spring wheat, 2½ bu. of oats and from 2½ to 3 bu. of barley. The results of date of sowing tests are also reported, and a table states the yields secured in a rather inconclusive test of acid phosphate, muriate of potash, and nitrate of soda in various mixtures for spring wheat. The use of a surface soil packer apparently increased the barley yields by about 5 bu. per acre. Among 8 varieties or strains of alfalfa, spring sown in 1909, *Medicago falcata* and Grimm from Excelsior, Minn., showed in 1910 that about 100 and 95 per cent of their plants, respectively, had survived the winter as compared with from 20 to 92 per cent among the others tested. Alfalfa inoculated with soil and with a commercial culture yielded 9,216 and 7,552 lbs. of green material per acre, respectively.

[Field crops at the Florida Station], J. M. Scott (*Florida Sta. Rpt. 1911, pp. XX–XXVI, figs. 2*).—In a test of 8 varieties of cowpeas, each of which was sown broadcast and also planted in rows and cultivated, Brabham, Peerless, and Iron produced the highest yields. Brabham and Iron were the only varieties found to be resistant to root-knot. Broadcast sowings gave greater yields in the case of 3 varieties, but averaged much lower when all varieties were considered. Broadcasting required 50 per cent more seed but gave a better quality of hay for horses and mules because it was mixed with crab grass.

Among 80 soy bean varieties tested Mammoth, Black, Neilson, Yellow, Canton, and Edwards are noted as worthy of further trial. The Yokohama bean

ripened its seed much earlier than the velvet or Lyon bean and is recommended as a cover crop in citrus groves because it does not produce so rank a growth.

Japanese cane cultivated 2, 4, and 6 in. deep yielded 16.6, 16.5, and 18 tons of green material per acre, respectively, as compared with 17 tons on a plat cultivated 6 in. deep at first and 2 in. deep afterwards. In a test of 8 applications of fertilizers (E. S. R., 24, p. 733), in 1909 much the highest calculated yield of sirup followed an application of 112 lbs. dried blood, 84 lbs. sulphate of potash, and 224 lbs. of acid phosphate. This plat also produced one of the highest yields in 1910.

Hand-selected Lyon bean seed yielded 11.9 bu. per acre as compared with 10.96 bu. in case of seed taken as it came from the huller. The kudzu vine yielded about 2¾ tons of cured hay per acre at 2 cuttings, but as the vines made almost no growth after the second cutting, the author believes that 2 cuttings per season is more than the plant will stand. This vine has not given promising results thus far.

The fourth consecutive crop of velvet beans yielded 13.9 bu. of shelled beans per acre as compared with 21.76 bu. on an adjoining plat which had not previously grown velvet beans. White velvet beans yielded 15.23 bu. of shelled beans per acre. Hand-selected seed yielded 11.98 bu. as compared with 16.1 bu. in case of seed taken as it came from the huller.

In a test of 9 varieties of corn, the Station, Evans, Poorland, and Rawls varieties gave the highest yields in 1910. Winter frost injured the guinea grass tested. Guinea grass fertilized with nitrate of soda, muriate of potash, and acid phosphate yielded 3,370 lbs. of cured hay per acre, whereas a plat in which dried blood was substituted yielded but 2,341 lbs. Para grass yielded 2,400 lbs.

Report on the agricultural stations in the Central Provinces and Berar for the year 1910–11 (*Rpt. Agr. Stas. Cent. Prov.* [*India*], *1910–11, pp. 115, pls. 2*).—This is a report of work at the experimental farms at Powarkhera, Nagpur, Akola, Raipur, Telinkheri, Nawagaon, Ramtek, Bhandara, Chanda, and Chhattisgarh, with results largely in harmony with those already noted (E. S. R., 26, p. 232).

At the Powarkhera farm the use of 20 lbs. of nitrogen applied in calcium cyanamid or calcium nitrate was followed in each case by a much higher wheat yield than the same amount of nitrogen applied in saltpeter, ammonium sulphate, a mixture of the two, oil cake, or farmyard manure; by sorghum yields of 778 and 840 lbs. of grain per acre as compared with 570 lbs. on the check plat; and by yields of seed cotton of 221, 204, and 144 lbs. per acre, respectively. A somewhat higher hay yield followed the application of a mixture of 41½ lbs. of superphosphate and 25 lbs. of ammonium sulphate, than the same mixture in addition to 10 lbs. of sulphate of potash, or various other mixtures.

In a variety test of peanuts, Chinese No. 2 and Egyptian produced the highest yields, and the latter is reported as entirely free from the "Ticca disease," which slightly affected 3 varieties. Other work at this farm included work with various implements, oats, wheat, gram (*Cicer arietinum*), rye, sugar cane, soy beans, velvet beans, flax, sesame, pigeon peas, Jalalia, and other crops.

At the Akola farm applications of night soil after the Meagher system applied every third year, bone dust and saltpeter, or 1-year-old poudrette, in amounts supplying 20 lbs. of nitrogen per acre, were followed by 5-year average rice yields decreasing in the order named. Other applications tested were castor cake, dried leaves of trees, calcium cyanamid, cattle dung, and 640 maunds (about 26.28 tons) of tank silt per acre. Equal applications of the same materials were used in other tests with rice, with rather similar results. Planting single seedlings in holes 6 in. apart produced much higher yields than when bunches were planted.

At the Raipur farm the application of 20 lbs. of nitrogen in night soil after the Meagher system was followed by greater yields of rice and higher profits than followed applications of 1-year-old poudrette, castor cake, dried leaves, cattle dung, or a mixture of bone dust and saltpeter. Financial losses followed the use of calcium cyanamid, bone dust, and a mixture of bone dust and sulphate of ammonia in this experiment. The application of 30 lbs. of nitrogen to irrigated wheat resulted in financial losses in each case except when a night soil was used, although the use of castor cake and of 4 applications of calcium nitrate to irrigated wheat was followed by substantial increases in yield.

Applications of 20 lbs. of nitrogen per acre in night soil, bone dust, a mixture of bone dust and saltpeter, and 1-year-old poudrette were followed by greater 5-year average yields of transplanted rice under irrigation than when dung, castor cake, dried leaves, calcium cyanamid, or a mixture of bone dust and sulphate of ammonia were used. Two other tests of the same fertilizers on transplanted rice under irrigation gave somewhat similar results. In case of plantings of 1, 2, or 3 seedlings or bunches of rice seedlings in holes 6 in. apart both the yield and the profit decreased as the number of seedlings per hole was increased.

[Fertilizer and variety tests], E. Thompstone (*Dept. Agr. Burma, Rpt. Mandalay Agr. Sta., 1910–11, pp. 38*).—In a test of bone meal, nitrate of soda, saltpeter, cotton cake, and farmyard manure in various amounts and mixtures as fertilizers for rice, the 3 highest grain yields were produced by the plats to which farmyard manure was applied. In 2 different localities higher grain yields were produced when the paddy straw was plowed under than when it was burned, but still higher yields were secured when 12,000 lbs. of cattle manure per acre was applied. An application of 6,000 lbs. of cattle manure per acre was followed by much greater grain and straw yields than when hemp, jute, or dhaincha were plowed under as green manures.

A greater yield was obtained after dhaincha than after San hemp or indigo used as green manures.

The results of tests of 16 sorghum varieties, 13 peanut varieties, 6 soy bean varieties, 4 cotton varieties, and of a number of miscellaneous crops are reported.

[Crops and green fodder in winter], G. Marks (*Agr. Gaz. N. S. Wales, 23 (1912), No. 2, pp. 148–155, pls. 2, figs. 3*).—This article reports the results of variety tests of wheat, oats, rye, and barley on 5 farms. The use of 1½ cwt. of superphosphate per acre apparently doubled the yield of oats and almost doubled the yield of a mixture of wheat and vetch.

Cooperative experiments of the department of agronomy, M. F. Miller and C. B. Hutchison (*Missouri Sta. Circ. 54, pp. 151–162, fig. 1*).—This circular gives directions for the use of farmers who cooperate with the station in fertilizer and inoculation tests of alfalfa, variety tests of corn, oats, wheat, and barley, tests of grass and clover mixtures for the Ozark upland, fertilizers for potatoes, and the adaptation of crimson clover and vetch to Missouri conditions are also discussed.

Emergency crops for overflowed lands in the Mississippi Valley, B. Knapp (*U. S. Dept. Agr., Bur. Plant Indus. Doc. 756, pp. 8*).—A brief review of agricultural problems growing out of the flood of 1912 is followed by suggestions for producing field and garden crops under the unusual conditions following the flood.

Top dressing grass lands.—The sowing of red clover, A. E. Grantham (*Delaware Sta. Bul. 95, pp. 7*).—Suggestions are given on the spring sowing of clover seed and the top dressing of grass land.

In tests at the station, poor land seeded to a mixture of red clover, alsike clover, and timothy in September was top dressed during each of the two succeeding years with nitrate of soda, acid phosphate, and muriate of potash, singly or in various combinations and amounts. Nitrate of soda gave the largest returns when used singly or in combination, and no application without nitrogen paid for the fertilizers used.

Separation of Swiss cereals into different types, G. MARTINET (*Ann. Agr. Suisse, 12 (1911), No. 4, pp. 223–258, figs. 5*).—The author states that Swiss cereals are mixtures of types because of variation, mutation, and hybridization. He states in detail the observations made and the data gathered in separating types of oats, barley, and wheat during the period 1906–1910.

[Small grain varieties recommended] (*Agr. Gaz. N. S. Wales, 23 (1912), No. 2, pp. 137–140*).—These pages present lists of the varieties of wheat, oats, barley, and rye recommended by the department of agriculture of New South Wales. The recommendations were made by experimentalists and managers of the farms of the department in conference with others.

Alfalfa seed production, J. M. WESTGATE, R. MCKEE, and M. W. EVANS (*U. S. Dept. Agr., Farmers' Bul. 495, pp. 36, figs. 14*).—This publication is intended to set forth the best known methods for the successful production of alfalfa seed. The topics discussed include the soil, climatic, and other conditions affecting alfalfa seed production, methods of managing fields, harvesting the seed, utilizing the straw, cultivating in rows for seed, weeds, seed adulteration, and the commercial aspects of seed production, together with notes by F. M. Webster on the insect enemies of alfalfa seed.

The authors have found that the most successful crops of alfalfa seed are produced when a relative shortage of soil moisture accompanies comparatively high temperatures while the seed is maturing. The soil moisture must be sufficient to permit the setting of seed but not great enough to start new vegetative growth for the succeeding crop. This narrow margin is the principal cause of the great uncertainty in the alfalfa seed crop.

Seed 1, 5, and 10 years old gave germination tests of 93, 68, and 44 per cent, respectively. The following table summarizes the results of 5-day tests of seed about 3 months old conducted to determine the proper stage at which to cut for seed:

Condition of seed as affected by stage of maturity.

Stage of maturity.	Dead.	Alive.	Hard.	Capable of sprouting promptly.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Pods green and not yet fully filled out	94	6	0	6
Pods green but full size	73	27	12	15
Pods just turning from green to a light-straw color; plump	17	83	58	25
Pods turned to a light brown; plump	11	89	69	20
Pods turned brown; fully matured	9	91	68	23

[Alfalfa seed in color, germination, and structure], E. MACKINNON (*Agr. Gaz. N. S. Wales, 22 (1911), No. 12, pp. 1058–1063, fig. 1*).—The author summarizes earlier work on this subject giving numerous citations to authorities quoted. Yellow seed averaged 92 per cent in germination tests as compared with 44 per cent for brown seed, 9.3 for yellow hard seeds, and 4 per cent for brown hard seeds.

Second generation of the cross between velvet and Lyon beans, J. BELLING (*Florida Sta. Rpt. 1911, pp. LXXXII–CIV, figs. 17*).—The characters of the

first hybrid generation have already been noted (E. S. R., 25, p. 436). From data herein presented on the characters of the second hybrid generation, the author draws conclusions which follow:

Out of 316 plants, 43 were distinctly earlier in flowering than either the Lyon or velvet beans grown in the same field, while 44 were much later. This character evidently segregates. The pods and beans of some plants were much larger than those of the Lyon bean, while those of other plants were smaller than in case of the velvet bean. This character segregates, possibly with two factors.

The hairs on the shoots segregated into dark, velvety, and other mixed or lighter classes which were not readily separable in the field. The ratio of lighter to dark velvety hairs was 256:51. Dark velvety shoots were more or less closely coupled with smooth convex leaves, dark velvety pods, partly with late flowering, and in some cases with abnormal flowers in small bunches, dropping of flowers, few pods to the bunch, and few seeds to the pod. The purple color of the wings and, to a less degree, of the standard segregated in the ratio of 3:1. The hairs on the pods segregated into long stiff, short stiff, and long dark weak hairs with some intermediates.

The lengths of the 5-seeded pods gave a curve divided in the ratio of 3:1. The opening of pods appeared to be a dominant character. The ratio of plants with all closed pods to those with one or more open pods was 1:3. The average weight of one seed reckoned as a percentage of the average weight of a 5-seeded hull gave a number for use in comparison of the proportion of hulls to seeds. This figure is low in the Yokohama bean, higher in Lyon, and highest in the velvet bean. Among 115 segregates it gives a curve with two maxima, one beyond the velvet bean. The average number of beans in the velvet and Lyon pods were about the same, but the plants of the second generation hybrid varied greatly in both directions in this respect.

The crops of good seeds produced by the segregates showed much more variation than did those produced in the same field by parent strains of Lyon and velvet beans. Some plants produced seed which appeared more subject to mold than was the case with either Lyon or velvet, and the same was perhaps true of wrinkled seed. Seeds from different plants, presumably of the same pure line, showed greater variation in average dimensions than did different pickings from the same plant. Bean length was correlated with pod length and segregated in the ratio of 3:1. Breadth and thickness did not visibly segregate independently of the lengths, but the shorter beans were broader and thicker relatively to their lengths than were the long seeds. The average breadth was about the average of the Lyon and velvet strains. Mottling perhaps resulted from 3 independent factors, and the ratio of mottled to unmottled beans was apparently 63:1.

A statement of the technique used in the crossing of stizolobiums is followed by brief notes on pure lines of velvet beans, some corn crosses, and analyses of the juice of West Indian sugar canes. B. 208 stood highest in Brix reading and in percentage of sucrose as indicated by the polariscope.

Corn production, G. Roberts and E. J. Kinney (*Kentucky Sta. Bul. 163, pp. 173–200, figs. 4*).—Directions are given for corn production in Kentucky, including soils and fertilizers, seed improvement, cultural methods, and harvesting. Census figures showing the yield of corn in Kentucky in 1909, by counties, are appended.

The results of a test of rates of seeding and methods of planting are regarded as indicating "that in a favorable season 3 stalks per hill will give a higher yield than 2 stalks, and that drilled corn yields better than corn planted in

hills when the rates of seeding are equal." When the corn was drilled, however, planting 12 in. apart, equivalent to 4 stalks per hill, gave a still higher yield in 1910.

Cotton and cotton culture, O. O. CHURCHILL and A. H. WRIGHT (*Oklahoma Sta. Bul. 97, pp. 3–28, figs. 7*).—This bulletin is intended to furnish practical information on cotton culture under Oklahoma conditions. It is based on experimental work at the station, and variety tests are reported.

In 1911, Simpkin Prolific, English Ounce Boll, and Extra Big Boll produced the highest yields and Texas Storm Proof stood rather low, although it stood quite high in average yield among the varieties tested during the period 1903–1910. It is the only variety whose yield is reported for each year during this period.

Directions for cotton production in Oklahoma are followed by a discussion of insect pests and by maps showing the cotton producing area of the State, the average rainfall at the various recording stations, and the dates of the last spring and first fall killing frosts.

Experiments with varieties of cotton, J. N. HARPER and F. G. TARBOX, Jr. (*South Carolina Sta. Bul. 162, pp. 3–8*).—Notes on 27 varieties of cotton tested during 1911 are presented.

The seeding of cowpeas, M. F. MILLER (*Missouri Sta. Circ. 53, pp. 147–150*).—Directions for seeding, harvesting, and threshing cowpeas in Missouri.

Thousand-headed kale and marrow cabbage, L. J. CHAPIN (*Washington Sta. Bul. 6, spec. ser., pp. 8, fig. 1*).—The feeding value, culture, and seed production of these crops are discussed, with methods of combating the root maggot. See also a previous note (E. S. R., 23, p. 436).

Changes in the composition of the oat plant as it approaches maturity, T. E. KEITT and F. G. TARBOX, Jr. (*South Carolina Sta. Bul. 163, pp. 16*).—Analyses of samples taken almost daily from May 11, when the heads were part in bloom and part in boot, until May 26, when the grain was hardening, indicate the changes in composition of the oat plant during that period. The data obtained are presented in tables, from which the following conclusions are drawn:

During the last few days of maturity of the plant the increase in total dry matter was rapid. Prior to that time it was regular but not rapid. From the beginning of blooming to the time of hardening, the seed increased from 17 to 39 per cent of the entire plant by weight, and the leaves decreased from 47 to 28 per cent of the plant. The straw percentage reached its maximum when the oat was in the milk stage. The protein in the seed glume, leaf, and straw increased until the milk stage after which it decreased rapidly. The water content remained high and rather constant during the blooming period, decreased suddenly at the beginning of the milk stage and then remained very constant until the oat began to turn when it again decreased. The ash reached its maximum for the entire plant when the protein reached its maximum. Very little starch formed before the first signs of milk, the carbohydrates being present before that time as invert and reducing sugar, mainly the latter. The sugar percentage decreased during the milk stage but increased slightly with the approach of maturity.

In order to obtain a nitrogenous forage, cutting should be done in the early milk stage, but if a forage high in carbohydrates is sought the grain should be cut at the beginning of the dough stage, since there is a rapid decrease in feeding value after this time in spite of the continued increase of starch in the seed.

The assimilation of phosphorites by oats and buckwheat, V. I. SAZANOW (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscou), 17 (1911), No. 1, pp.*

100–112, figs. 4).—These pages report the phosphoric acid contents of phosphorites from different regions. Pot tests to determine their assimilability by oats and buckwheat on sand and clay soils were conducted, and tables present the data obtained.

A new basis for estimating the value of potatoes, D. Zolla (*Rev. Gén. Sci., 22 (1911), No. 22, p. 887*).—The author suggests the use of the microscope in determining the value of potatoes for specific purposes. Fine grained potatoes should be planted for the table crop. Starch potatoes for manufacturing purposes differ histologically from table potatoes in that their tissues are less compact and their cells large and rich in starch.

Rye selection at Svalöf, 1910, E. W. Ljung (*Sveriges Utsädesför. Tidskr., 21 (1911), No. 6, pp. 321–323*).—These pages briefly summarize the results of 21 comparative experiments. A table states the grain and straw yields secured, the weight per bushel and per 1,000 kernels, the date of harvest, and the degree of resistance to lodging.

The quality of grain in the season 1910–11, E. Schaffnit (*Illus. Landw. Ztg., 31 (1911), No. 99, pp. 911, 912*).—Analyses of many rye samples of an abnormal orange-yellow color showed that they were higher in protein content than the usual brown seeds. In germination they tested 98 per cent or over but in growing tests only about 79 per cent.

During this same dry season red, yellowish-red, or even violet-colored straw occurred. It was attributed to the accumulation of carbohydrates or tannic substances due to disturbed metabolism. The violet straw contained 5.8 per cent protein and 1.6 per cent of fat as compared with 3.1 and 1.3 per cent, respectively, in the ripe yellow straw.

The sugar beet in 1911, E. Saillard (*Jour. Agr. Prat., n. ser., 22 (1911), No. 44, pp. 562–564*).—Tables state the chemical composition of sugar beets during each year of the period 1907–1911.

The 1911 crops contained more amid, ammoniacal, and injurious nitrogen than those of preceding years, and the alkalinity during evaporation was less pronounced. Analyses during 1907–1910 indicate that when the ratio of nitrogen to sugar is highest, that of albuminoid nitrogen to total nitrogen is lowest.

Biometrical studies of tobacco varieties, G. Rinaldi (*Bol. Tec. Coltiv. Tabacchi [Scafati], 10 (1911), No. 6, pp. 331–366*).—Tables state in full the data gathered in studies comparing some of the principal tobacco varieties throughout the vegetation period. The amount of water required for germination, the amounts retained in the different organs of the plant, and the amounts contained in the plants at different periods of growth are also reported.

The weight of topped plants was greater than that of the untopped plants of the Kentucky, Havana, and Brazil varieties, and was about equal in Herzegovina or Sumatra plants, but in case of Erbasanta and Chinensis, which represented *Nicotiana rustica*, the plants with ripe seed excelled in weight. The author found that Erbasanta and Chinensis had at first a higher dry matter percentage than plants of the 5 varieties of *N. tabacum* studied, but during later vegetation periods they stood below the Havana and Sumatra varieties in this respect.

The early fertilization of tobacco seedlings and their later development, L. Montemartini (*Staz. Sper. Agr. Ital., 44 (1911), No. 10, pp. 794–796*).—These pages state the results obtained by sowing tobacco seed in April in sand-filled earthen vessels. Different artificial fertilizers were added to the 5 pots in the test and the plants were transplanted late in May. They were set in 2 beds, one of which was well fertilized and exposed to the sun, while the other was shaded and rather sterile.

At the time of transplanting the plants, those that had received Wagner salts seemed best developed, while those that had received a mixture of nitrate of potash and nitrate of ammonia came next, followed by those that had received potassium phosphate. The plants that had been given only nitrate of ammonia lived but a short time after transplanting. Those that had received calcium phosphate appeared weak when transplanted but by August they excelled the others of both beds in height and in size of leaf. The author regards these results as substantiating his earlier conclusions on the value of calcium phosphate as a fertilizer for solanaceous plants when they are making their first growth.

Field experiments with wheat, F. DITZELL (*Agr. Gaz. N. S. Wales, 23 (1912), No. 2, pp. 122–136*).—These pages report rotation, fertilizer, cultural, and method of seeding tests with wheat at the Cowra experiment farm of the department of agriculture of New South Wales.

The effect of carbon bisulphid on the germination of wheat, A. MORETTINI (*Staz. Sper. Agr. Ital., 44 (1911), No. 5–6, pp. 417–422*).—Experiments on 2 varieties of wheat indicated that the use of carbon bisulphid at the rate of 35 gm. per hectoliter did not injure the germinating power unless its action was concentrated on one part of the heap, as when it was poured directly on the grain.

Plant breeding methods, A. HUMMEL (*Fühling's Landw. Ztg., 60 (1911), No. 22, pp. 761–780, figs. 6*).—The author deals with the relative advantages of mass selection, individual selection, and continued individual selection, and reports tests of these methods in 1910–11 at Neustettin where he worked on the time of flowering of rape and turnips.

Mass selection changed the time of flowering about 1 day, and a combination of individual and mass selection advanced the time of blooming from 1 to 3 days. Tables and curves state in detail the results obtained.

[Seed tests], S. HAMMAR (*Bcr. Verks. Skara Kem. Stat. Frökontrollanst., 1911, pp. 19–26*).—Tables state the results of purity tests and mechanical analyses of seeds of small grains, legumes, and grasses.

Studies with dodder.—I, The germinability of the seeds. II, Infection studies, A. VON DEGEN (*Landw. Vers. Stat., 77 (1912), No. 1–2, pp. 67–128, figs. 6*).—The author studied in the first series of experiments the germination of the seeds of *Cuscuta trifolii* and *C. suaveolens* as regards time of sprouting under favorable conditions, and in the second the ability of the seeds of *C. suaveolens* to endanger crops by producing plants under the conditions existing in the open fields. The more significant results are as follows:

The germinability of *C. suaveolens* is higher than that of *C. trifolii*, the two being in the experiments made 67.6 and 47 per cent, respectively, of the seeds tested. Both these dodders show a protracted energy of germinability. The greatest percentage of germination occurred in the month of seeding, but thereafter there was a steady decrease to mere sporadic appearances during the 27 or 28 months of observation, and at the end of this time there remained, having neither sprouted nor rotted, 12.5 per cent of the seed of the first and 6 per cent of that of the second species. This delayed germination constitutes a continuous source of danger from these parasitic vines. It is, however, decreased by the fact that germination is retarded by the shading due to luxuriance of the host crops, and is lessened by deep planting, while shallow seeding and the more abundant light after harvest tend to sprout the seeds at such times.

The results obtained in the second series led to the conclusion that clover seed containing not more than 3 seeds of dodder per kilogram is entirely safe for planting, as very few of the parasitic plants may be expected to develop

from such seed. Planting at from 2½ to 4 cm. in depth below the surface is considered sufficient protection in case of clover seeds containing as high as 10 seeds of dodder per kilogram. This species of dodder is a southern plant and is sensitive to low temperatures.

Michigan weeds, W. J. Beal (*Michigan Sta. Bul. 267, pp. 277–458, pl. 1, figs. 248*).—This bulletin is a companion to Bulletin 260, already noted (E. S. R., 23, p. 439). It describes briefly and illustrates the more important weeds of Michigan, and is intended to aid students and farmers in recognizing some of them. Methods of eradication are briefly discussed.

HORTICULTURE.

[Horticultural work at the Canadian experiment stations and farms in 1910], W. Saunders, W. T. Macoun, F. T. Shutt, et al. (*Canada Expt. Farms Rpts. 1911, pp. 25–28, 101–122, 128–130, 133–135, 198–200, 307–313, 337–340, 388–394, 414–424, 474–476, 502–505, 506, 507, 519–524, 525–530, pls. 3*).—This is the customary report on the breeding and cultural experiments with fruits, vegetables, forest and ornamental trees, and herbaceous plants being conducted at the Central Farm, Ottawa, and at the various branch experiment stations and farms in Canada (E. S. R., 24, p. 440).

A number of seedling apples received at the Central Farm for examination are described and descriptions are also given of 13 additional seedling apples originated on the farm. Thus far a total of 720 trees from seeds sown in 1898 and later have fruited. Descriptions of these fruits, whatever their character, have been made and a large amount of data has been thus accumulated. Certain characteristics of 581 seedlings of 11 varieties are presented in tabular form and compared. There appears to be considerable variation between seedlings from the same female parent, the male parentage of the seedlings not being definitely known.

To throw some light on the fruit-yielding possibilities of different varieties of apples, a table is given showing the yields of the best yielding tree of a number of varieties from the third to the twenty-second year after planting. To illustrate the individuality of the trees, yields for the period 1899 to 1910 are also given of a number of individuals of the same variety of apples. Trees grown practically under the same conditions have shown a wide variation in yield.

One of the most promising seedling plums fruiting during the year was the Dara, which is here described. The downy leaved cherry (*Prunus tomentosa*), a bush cherry, is found to be hardier than the tree cherries and promises to be a very useful fruit for the colder parts of Canada. The King red raspberry is proving to be one of the hardiest varieties in the prairie Provinces.

A list is given of the varieties of vegetables which have proven to be most successful in the farm tests. The work of selecting tomato seed to develop superior early strains was continued. The results, as here tabulated, show that all of the selections have progressed in the direction in which the selection was made. In the selection for large early production, the yield has increased each year and the tomatoes selected for earliness have ripened earlier than those selected for productiveness and uniformity without regard to earliness. Improvement in uniformity has not yet been marked.

In the forest belts on the Central Farm, the trees which were planted 5 by 5 ft. apart in plats of single species are in most cases making the best trees from a timber standpoint since the side branches are soon killed out. It is suggested that this distance might be reduced with advantage to 4 by 4 ft. Growth measurements for the period 1907 to 1910 are given for a number of trees planted in various soils and at different distances.

The work at the branch stations and farms consisted largely of variety tests. Analyses of lime-sulphur washes and arsenate of lead are also reported.

Beginners' guide to fruit growing, F. A. WAUGH (*New York and London, 1912, pp. 120, pl. 1, figs. 62*).—This work is offered as a simple statement of the elementary practices of propagation, planting, culture, fertilization, pruning, spraying, etc. It also includes chapters on varieties of fruit for different sections and orchard renovation.

Horticultural statutes of the State of California, 1912 (*Sacramento: State Com. Hort., 1912, pp. 146*).—This comprises the horticultural statutes with court decisions and legal opinions relating thereto, also state quarantine and county ordinances relating to horticulture, and a list of state and county horticultural officers corrected to February 1, 1912.

Combating orchard and garden enemies, W. H. CHANDLER (*Missouri Sta. Bul. 102, pp. 239–290, figs. 37*).—The more important insect pests and fungus diseases of fruits and vegetables are briefly described, and directions are given for their control as well as for the preparation of fungicides and insecticides and for protecting trees against rabbits and mice.

Ampelography of the Crimea, S. KORSHINSKY (*Trudy Biûro Prikl. Bot. (Bul. Angew. Bot.), 3 (1910), No. 9–10, pp. 323–478; 4 (1911), Nos. 8–9, pp. 267–458; 10, pp. 465–540, pls. 64, figs. 102*).—A descriptive account of the cultivated varieties of grapes in the Crimea, based on studies conducted in the period 1898 to 1900. A number of self- and cross-pollination experiments conducted with 23 Crimean grape varieties are also described.

The text is accompanied by a number of illustrations showing the character of the fruit and foliage of different species.

Statistics on the production of grapes and olives in 1911 (*Estadística de las Producciones Viticola y Olivarera en el Año 1911. Madrid: Govt., 1912, pp. 9*).—A statistical review of the production of grapes, wine, olives, and olive oil in the regions and Provinces of Spain for the year 1911.

Citrus experiments, A. W. BLAIR (*Florida Sta. Rpt. 1911, pp. XXVII–XXXI, figs. 3*).—This comprises a progress report on the fertilizer experiments with citrus fruits previously noted (E. S. R., 25, p. 427). Measurements have been made of the trees on each plat 3 times a year and tabular data are given showing the average gain in diameter of the trees on each plat from June 7, 1909, to June 21, 1911.

The experiment thus far does not indicate any marked growth increase in favor of any particular fertilizer used. The clean culture plats on the whole are slightly above the general average in appearance, and some of the trees in the plat which has received no fertilizer are beginning to indicate by a yellowing of the leaves a need of nitrogen. Considerable die-back was observed in the grove in 1910, but no relationship was found between the fertilizers used and the presence or absence of die-back.

A practical method of artificially ripening Japanese persimmons, F. E. LLOYD (*Proc. Ala. State Hort. Soc., 9 (1912), pp. 57–63*).—The author reviews Gore's experiments in ripening persimmons with carbon dioxid (E. S. R., 25, p. 744), and summarizes the results secured in his own work at the Alabama College Station during 1911 (E. S. R., 26, p. 327).

Large scale experiments on the processing of Japanese persimmons; with notes on the preparation of dried persimmons, H. C. GORE (*U. S. Dept. Agr., Bur. Chem. Bul. 155, pp. 20, figs. 3*).—In previous experiments conducted cooperatively by the Bureaus of Chemistry and Plant Industry (E. S. R., 25, p. 744) it was found that upon keeping unripe persimmons for several days in an inert gas, such as carbon dioxid, they become nonastringent while remaining firm. During the season 1911 these experiments with carbon dioxid were

extended to a semicommercial scale in order to determine the value of the method when applied to the commonly grown varieties of Japanese persimmons. The method used in this work is described in detail and an account is given of experiments in the application of the method to persimmons in Florida and at Washington, D. C. A laboratory method of drying persimmons which has given an excellent product in appearance and flavor is also described.

All of the varieties processed became nonastringent when kept in carbon dioxid, the time required for processing ranging from 1½ to 7 days, depending on the variety. The varieties processed in Florida were subjected to a shipping test. With one exception (the yellow-fleshed Zengi) processing greatly injured the naturally excellent shipping qualities of the fruit, but the Tane-nashi variety was less seriously affected than many of the others.

Contrary to the results noted in the previous experiments, no undesirable effects were produced by high humidity while in process. Processing required a longer time in Washington than in Florida, presumably on account of the lower temperatures. It was found that the softening of the fruit after processing can be considerably retarded by keeping at refrigerator or cold storage temperatures.

The results as a whole indicate that the carbon dioxid ripening process can be recommended generally for treating persimmons for local distribution. Processing may also be successfully employed after shipment.

Covering almond trees for frost protection, A. G. McAdie (*Mo. Weather Rev., 40 (1912), No. 2, pp. 282, 283, figs. 2*).—Some experiments in covering almond trees with paper at the university farm, Davis, Cal., during February and March, 1912, are reported and discussed.

The paper used was a weatherproof manila and was first put on at 5 p. m. February 19, and removed at 9 a. m. February 21. It was again put on at 5 p. m. February 25, and removed at 8 a. m. February 26, then again put on at 6 p. m. on February 26 and left on until 8 a. m. March 1. Temperatures were taken both under the cover and outside.

A minimum temperature of 19° F. occurred a little after 8 a. m. on February 26, whereas under the cover the temperature fell to 24°. In general the temperature curves were quite similar, the temperature under the cover being higher in every case. The loss of heat, however, while retarded by the cover, was not sufficiently decreased to warrant extensive use of the method in its present form. Likewise, while there was a difference between the inside and outside rates of warming after sunrise, the rate of warming under the cover was still too rapid. It is suggested that a more effective barrier to insolation can be made by using a double cover with an intervening air space.

Although the almonds were lost the author infers from the experiment that with proper care and improved methods fruits can be protected from the strains incident to rapid loss of temperature and rapid heating, within moderate limits.

Cranberry bog management for Wisconsin, O. G. Malde (*Wisconsin Sta. Bul. 219, pp. 3–25, figs. 13*).—In a previous bulletin of the station the principles and methods of establishing cranberry bogs were described (E. S. R., 26, p. 841). The present bulletin considers the management of a cranberry bog from the time of planting up to the time of harvesting. The subject matter is discussed under the following general headings: Care of new planting, care of bearing cranberry vines, destroying the weeds, fertilizers for cranberries, protecting bogs from frosts, protection from insects, reclaiming old cranberry bogs, and marketing vines for planting.

Tabular data, based on a circular letter sent out in 1910, showing the average acreage, cost of handling, yield, and profits on Wisconsin cranberry bogs,

are given. The net earnings on clean, sanded bogs were 5 times as great as on semiwild bogs, the increase in yield 4 times as great, and there was a great decrease in the cost of harvesting.

Ginseng and golden seal growers' handbook, J. H. KOEHLER (*Wausau, Wis., 1912, pp. VII+116, pls. 41*).—A popular handbook of information relative to the history, uses, market, commercial value, culture, diseases, and insects of ginseng, with briefer reference to the golden seal. The subject matter is based upon the author's experience as a grower as well as on the investigational literature on the subject.

Status and prospects in ginseng industry, M. G. KAINS (*Amer. Agr., 89 (1912), No. 24, p. 755*).—A note on the present status of ginseng culture in the United States.

Lavender cultivation, J. KNIGHT (*Jour. Dept. Agr. Victoria, 10 (1912), No. 5, pp. 316–321, figs. 5*).—A popular account of lavender culture and the oil extraction in Victoria.

A practical handbook of trees, shrubs, vines, and herbaceous perennials, J. KIRKEGAARD (*Boston, 1912, pp. 407, pls. 60, figs. 3*).—The larger part of this work, which is offered primarily as a reference book of hardy ornamental trees and plants, is given up to a tabular description and classification of species, including notes on their important characteristics, uses, and treatment. In addition to the descriptions many of the uncommon or partially known species and varieties are illustrated. Other features of the work include planting lists and plans, general information relative to planting operations, and notes on rose culture and lawn making, together with lists of trees and plants for special purposes.

An article by H. T. Fernald on The Insect Pests of Shade Trees and Shrubs is also included.

Lawn soils and lawns, O. SCHREINER, J. J. SKINNER, L. C. CORBETT, and F. L. MULFORD (*U. S. Dept. Agr., Farmers' Bul. 494, pp. 48, figs. 19*).—This comprises an adaptation with revisions of the subject matter in Farmers' Bulletin 248 (E. S. R., 17, p. 976) and Bureau of Soils Bulletin 75 (E. S. R., 24, p. 712).

FORESTRY.

Forest conditions in the northern Ozarks of Arkansas, W. W. BENNETT (*Forest Club Ann. [Univ. Nebr.], 4 (1912), pp. 61–67*).—A descriptive account of forest types occurring in the northern Ozarks.

Notes on forest conditions in northwestern Nebraska, R. J. POOL (*Forest Club Ann. [Univ. Nebr.], 4 (1912), pp. 51–60, pls. 3*).—A descriptive account of forest types occurring in northwestern Nebraska.

Trees of Omaha, S. V. FULLAWAY, Jr., and W. R. CHAPLINE, Jr. (*Forest Club Ann. [Univ. Nebr.], 4 (1912), pp. 24–38*).—A contribution to the knowledge of the native and exotic trees of Nebraska, consisting of a list of 171 species, of which 38 are native to the State. The scientific and common name, the maximum diameter and height, and the native habitat of each species are given.

The catalpas and their allies, H. GARMAN (*Kentucky Sta. Bul. 164, pp. 203–223, pls. 9, figs. 8*).—The author calls attention to the characteristics distinguishing the western catalpa (*Catalpa speciosa*) from the southern catalpa (*C. bignonioides*). Consideration is also given to the importance of the western catalpa as a wood for fence posts and railway ties, propagating and growing the trees, rate of growth, characteristics of the wood, and enemies of the catalpa. Brief descriptive notes are also given of some related species, including the trumpet creeper (*Tecoma radicans*), the cross vine (*Bignonia*

capreolata), and the Japanese catalpa (*C. kæmpferi*), together with an account of the trumpet creeper leaf miner (*Octotoma plicatula*) and its control.

Utah juniper in central Arizona, F. J. PHILLIPS and W. MULFORD (*U. S. Dept. Agr., Forest Serv. Circ. 197, pp. 19, pls. 2, fig. 1*).—The Utah juniper (*Juniperus utahensis*), which is considered the most important tree of the woodland forest of central Arizona, is here discussed relative to its distribution, climatic requirements, botanical characteristics, silvical characteristics, growth, volume, yield, utilization, and management.

Quebracho wood and its substitutes, C. D. MELL and W. D. BRUSH (*U. S. Dept. Agr., Forest Serv. Circ. 202, pp. 12, pls. 2, fig. 1*).—This circular discusses the uses and distinguishing characteristics of the quebracho (*Quebrachia lorentzii*), a South American wood yielding a valuable tanning extract, and of the principal woods substituted for the quebracho, and presents a key for their identification.

Cinchona in Java from 1872 to 1907, being extracts translated from the Scheikundige Bijdragen tot de Kennis der Java-kina, 1872 to 1907, K. W. VAN GORKOM, edited by D. HOOPER (*Agr. Ledger, 1911, No. 4 (Veg. Prod. Ser. No. 115), pp. 35–106*).—An English translation of the author's pamphlet, abridged and rearranged with special reference to its application to the cinchona industry in India. It comprises a historical account of the botanical, cultural, and chemical investigations which have been conducted in connection with the cinchona industry in Java.

Castilla and its culture, P. OLSSON-SEFFER (*Dept. Landb. Suriname Bul. 27, 1912, pp. 66, pls. 7*).—The late author's English manuscript on the culture and preparation of Mexican rubber is here translated into the Dutch language by J. Kuijper, and a summarized account of Castilla rubber in Surinam is appended, in which Castilla rubber is considered relative to its botany, distribution, species and varieties, cultural details, tapping, preparation of the rubber, and marketing.

A test of daily versus alternate daily tapping of Hevea, C. J. J. VAN HALL (*Teysmannia, 23 (1912), No. 2, pp. 92–99*).—Two lots of 300 trees each were tapped from March 15 to December 14. In the first period lot A was tapped daily and lot B every other day. The tapping was reversed in the second period, resumed in the third period, and again reversed in the fourth period.

The data as here tabulated indicate that daily tapping produces a much higher yield of rubber than tapping every other day.

Notes on bark structure, T. KRUEGER (*Forest Club. Ann. [Univ. Nebr.] 4 (1912), pp. 142–156*).—As a result of a preliminary study of bark structure in a large number of American forest trees, the author presents tentative keys showing the more prominent bark characteristics of each genus as indicated by the limited number of species studied.

A sample dichotomous table for determination of coniferous species, L. PARDÉ (*Rev. Eaux et Forêts, 51 (1912), No. 11, pp. 340, 341*).—The author presents a specimen dichotomous key for the purpose of soliciting criticism and suggestions as to improvement.

The equipment and operation of a Prussian seed extracting establishment, A. B. RECKNAGEL (*Forestry Quart., 10 (1912), No. 2, pp. 229–234, figs. 2*).—A descriptive account, based on a personal inspection of a Prussian seed extracting establishment and offered as supplementary to a previous article by Wiebecke on the same subject (E. S. R., 23, p. 445).

The economic returns from forestry, with special reference to the Prussian state forests, MARTIN (*Tharand. Forstl. Jahrb., 63 (1912), Nos. 1, pp. 40–58; 2, pp. 79–142*).—A critical study of the construction and application of yield

tables, with special reference to the spruce, pine, and beech, based on an examination of tables prepared by various authorities. The study is discussed under the following general headings: Contents of yield tables, the conception of normal stand, application of yield tables, and the future returns from yield investigations.

Assistance to private owners in the practice of forestry (*U. S. Dept. Agr., Forest Serv. Circ. 203, pp. 8*).—This circular supersedes Circular 165 (E. S. R., 21, p. 444). It discusses the aims and nature of assistance given and contains the regulations governing cooperation with private owners, together with sample application forms.

Some permanent sample plat studies, C. F. KOBSTIAN (*Forest Club Ann. [Univ. Nebr.], 4 (1912), pp. 115–127, pls. 2*).—The author describes in detail some permanent sample forest plat studies which are being conducted by the Forest Service of the U. S. Department of Agriculture in the Sierras.

A method for determining the effects of forests upon run-off in the Rockies, R. D. GARVER (*Forest Club Ann. [Univ. Nebr.], 4 (1912), pp. 68–73*).—The author outlines a plan for the determination of the effects of forests upon streams.

The effect of forest fires on trees and reproduction in southern New England, P. L. BUTTRICK (*Forestry Quart., 10 (1912), No. 2, pp. 195–207, fig. 1*).—This paper discusses the factors influencing the resistance of trees to fire, the after effects of a single fire, the effect of recurring fires, fire in relation to sprouting, the effect of forest fires on reproduction, and the effect of age on resistance.

The need of fire protection in the Tropics, C. E. C. FISCHER (*Indian Forester, 38 (1912), No. 5, pp. 191–221*).—A review of the literature on this subject.

Rainfall a factor of tree increment, F. DAVIS (*Forestry Quart., 10 (1912), No. 2, pp. 222–228, fig. 1*).—Finding that the work of several European investigators appeared to show a correlation between tree increment and the amount of annual rainfall, the author studied tree specimens, principally from New England and the Eastern States, in conjunction with the monthly rainfall records. The results as here tabulated and discussed indicate that rainfall is a great factor in tree increment.

Notes on winterkilling of forest trees, C. P. HARTLEY (*Forest Club Ann., [Univ. Nebr.], 4 (1912), pp. 39–50*).—This comprises notes on the occurrence and nature of winter injury to forest trees as observed in district 2 of the Forest Service of the U. S. Department of Agriculture, including Colorado, Kansas, Nebraska, part of South Dakota, and Wyoming.

A new method of constructing volume tables, D. BRUCE (*Forestry Quart., 10 (1912), No. 2, pp. 215–221*).—The author describes a method of constructing volume tables which involves the use of what is termed the "frustum" form factor.

Sand blast tests of New South Wales timbers, W. H. WARREN (*Jour. and Proc. Roy. Soc. N. S. Wales, 44 (1910), pt. 4, pp. 620–630, pls. 5, figs. 4*).—The tests here described were conducted in order to obtain the relative values of timbers for wood paving, flooring, and similar purposes.

On the durability of railroad ties, K. HAVELÍK (*Centbl. Gesam. Forstw., 38 (1912), Nos. 3, pp. 105–115; 4, pp. 172–182; 5, pp. 224–233, figs. 5*).—This is a review of recent investigations along this line, with conclusions based on a study of the results as a whole.

Quantity and quality of creosote found in two treated piles after long service, E. BATEMAN (*U. S. Dept. Agr., Forest Serv. Circ. 199, pp. 8, pl. 1, fig. 1*).—This circular gives the results of analyses of creosote found in 2

treated piles which had been in the teredo-infested waters of the Gulf of Mexico for about 30 years.

One of the piles was perfectly sound, whereas the other had been attacked, particularly at the water line. No treating records were available. The analyses showed that the creosote in the perfectly preserved pile originally contained at least 40 per cent of naphthalene fractions, a large portion of which remained in the wood. The creosote in the less perfectly preserved pile contained little or no naphthalene.

DISEASES OF PLANTS.

[Report of the botanist on plant diseases in 1910], H. T. Güssow (*Canada Expt. Farms Rpts. 1911, pp. 239, 240, 244–260, pls. 4*).—During the year many diseases have been dealt with, among them rust of grains, mildew of wheat, bitter pit, anthracnose, black rot, bitter rot, rust, and sooty mold of apples, a bacterial blight of English walnut observed at Agassiz, B. C., diseases of plums, cherries, and small fruits, onion mildew, leaf spot of tomatoes, club root of crucifers, also the following which are given especial notice:

A frost injury to wheat is reported to occur on frosty nights on unevenly ripened grain lying freshly cut. The grains shrivel, becoming lighter in weight and darker in color than sound ones, and their germination is found to be lower and more uneven as to time, thus perpetuating the trouble.

A discoloration of the grains in wheat from several widely separated regions is described. The embryo is darkened, and the plant seems to lack vigor. Further investigations in this connection are contemplated.

A peculiar belting of pears with a band of russet corky cells was studied, and is attributed to chilling when young, these parts having been found to lack the coat of fine hairs claimed to give a measure of protection when present.

A new contagious disease of peaches has been observed in the Niagara district, extending into New York State. It manifests itself by cankers on trees of all ages and varieties, attacking and weakening any part so that large branches may be lost through breaking. The disease spreads rapidly, and has quickly become very serious.

Strawberries and raspberries are said to suffer injury during cold nights when in bloom, the frost killing some of the styles and thus causing the fruit to be malformed when matured. Protection by means of hedges or cheese cloth and by smudge fires, also spraying with cold water in early mornings, have been found useful as preventives of this injury.

Potato scab experiments having previously led to results apparently inconsistent, a series of annual tests was entered upon to determine the relative value of the treatments usually prescribed. The crops obtained by planting uniformly but not badly scabbed seed potatoes showed 54.8 per cent of scabby tubers from the untreated seed, 54.5 per cent from the carbonate of soda treatment (10 oz. in 10 gal. water), 53.3 per cent from the corrosive sublimate (1 : 2,000), and 38.4 per cent from the formalin solution (1 lb. in 30 gal. water). No conclusions are drawn.

Internal spotting of potatoes externally sound, caused by discoloration of the vascular bundles near the stem end, is reported. The trouble appears to be identical with that known as "sprain" in England and as "Eisenfleckigkeit" in Germany. Observers are not unanimous as to its cause. See also another note (E. S. R., 21, p. 447).

Leaf spot of elm (*Dothidella ulmea*) was found to extend back upon the petioles to the tips of the young shoots. These twist downward and are finally

killed, none recovering so far as observed. Removal and burning of all such parts in autumn is recommended.

Other parasitic fungi the occurrence of which is recorded are *Entomosporium mespili* on English hawthorn from Nova Scotia, *Lophodermium nervisequum* on *Abies* sp. from New Brunswick, and *Dasyscypha willkommii* from Nova Scotia.

Report of plant pathologist, H. S. Fawcett (*Florida Sta. Rpt. 1911, pp. LVIII–LXVII, figs. 3*).—This report summarizes investigations carried on during the fiscal year, the principal studies being made on diseases of citrus trees and in part previously noted (E. S. R., 25, p. 456; 26, p. 449). A number of experiments to control stem-end rot were conducted, but none of the treatments gave beneficial results.

Diplodia natalensis has been found to cause gummosis of peach and orange trees. In addition to these host plants, inoculation experiments have been made with the cultures of the organism on 18 species of native trees. The following 6 species produced gum with the killing of tissue: Wild plum, wild cherry, cherry laurel, prickly ash, sweet gum, and sumac. Four additional species showed bleeding with killing of tissue, but no gum. These were basswood, red bud, hackberry, and mulberry. Iron wood and water oak showed slight killing of tissue without any bleeding, while hawthorn, hickory, magnolia, holly, ash, and huckleberry were apparently not affected by inoculation with the fungus.

Brief notes are given on black rot due to *Alternaria citri*, blue mold rot caused by *Penicillium italicum* and *P. digitatum*, scab or verrucosis due to *Cladosporium citri*, and on the brown fungus of the white fly (*Aegerita webberi*).

Report of plant physiologist, B. F. Floyd (*Florida Sta. Rpt. 1911, pp. LXVIII–LXXXI, figs. 5*).—The principal work in the laboratory of plant physiology has consisted of a study of the nutrition and malnutrition of citrus plants, attention being given to some of the diseases that are supposed to be due to malnutrition. Among these are die-back, melanose, yellow spotting, and frenching.

Experiments are in progress with organic nitrogenous fertilizers to determine their effect, especially on die-back and melanose, and in conjunction with these experiments studies are being made on the maximum fertilization of citrus trees, particularly the nitrogen fertilization. Heavy fertilizing has been found to cause disturbances in the nutrition of citrus trees, resulting in the falling of the leaves and fruit, but experiments thus far indicate that the chemical injury shows itself only in the weaker parts of the plants.

Experiments on die-back have been begun in the citrus experimental grove near Tavares to determine the effect of certain fertilizers on the chemical and physical properties of the soil, upon the trees, and upon the quality and quantity of the fruit, and also to study the relation of the fertilizers to insect pests and diseases. The die-back, so far as the plat experiments have gone, seems to be independent of the fertilizers that have been used.

An extended report is given of the investigations on melanose, a disease of citrus trees which is distributed throughout Florida and is also known to occur in a number of other regions. In Australia the disease is claimed to be due to the fungus *Cladosporium brunneo-atrum* (E. S. R., 12, p. 655), but American investigators have never been able to isolate any fungus in cultures made from diseased material. Melanose seems to affect all varieties of citrus trees in Florida, the greatest injury being done to the fruit. The gross and microscopic characters of the disease are described, and the author concludes that it is probable that melanose is not caused by unfavorable growth factors,

but that it is a disease due to some unknown organism. If this organism is a fungus, it is thought that it probably exists only in a vegetative condition, and that its hyphæ are very diminutive, making it difficult to distinguish in the host tissue.

Notes on some mildews, E. Foëx (*Ann. École Nat. Agr. Montpellier, n. ser., 11 (1912), Nos. 3, pp. 246–248, fig. 1; 4, pp. 249–264, pl. 1, figs. 5*).—Notes are given on the formation of conidiophores of species of Erysiphaceæ; on the presence of two kinds of conidiophores in *Oidiopsis taurica*, a parasite of sainfoin; and on *Oïdium alphitoides*, the mildew that has been so abundant in Europe on the oaks within the past few years.

The specialization of Uromyces caryophyllinus, E. Fischer (*Mycol. Centbl., 1 (1912), No. 1, pp. 1, 2*).—In continuance of previous work (E. S. R., 24, p. 346), the present brief preliminary report states that the author tested the supposition that this fungus falls into several species living on different hosts. It is claimed that in repeated tests this fungus was successfully cultivated on *Tunica prolifera* but not on *Saponaria ocymoides*, and the conclusion is reached that here are two forms biologically distinct.

Corrosive sublimate as treatment for winter grains, L. Hiltner and Gentner (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 9 (1911), No. 9–10, pp. 117, 118*).—In pursuance of studies by the senior author on corrosive sublimate as protection from attacks of Fusarium, resulting from infected seed (E. S. R., 25, pp. 548, 652), observations were made on the crop of 1911.

It is stated that the percentage of attack was found not less than in the previous year, notwithstanding it is probable that more sublimate was used in 1911, but the authors claim that the degree of infection was lower. The reports show that in case of early sowings of rye a better stand of plants was obtained from the seed that had been first soaked in the sublimate solution. A later report on this subject is promised.

A wheat head disease, G. Fron (*Jour. Agr. Prat., n. ser., 23 (1912), No. 11, pp. 340–342, figs. 2*).—Illustrations and a brief description are given of a disease of wheat in France said to have been known there for about 30 years, but now becoming serious in some sections. The disease attacks the head. In some cases, only the middle portion is affected, but in severer cases the whole head is deformed and dwarfed, the chaff being flecked with black spots or covered with a dark mycelium which prevents development of all grains except possibly those at the ends of the spike. The affection is ascribed to the fungus *Dilophia graminis*. The author urges further studies of the disease.

Leaf roll of potato (*Ztschr. Landw. Versuchsw. Österr., 14 (1911), No. 7, pp. 911–915, pl. 1, fig. 1*).—This is the third report of the committee appointed for the study of this disease. The symptoms are fully described in order to prevent confusion between this and somewhat similar affections. Such means of combating the disease as chemical treatment of seed tubers, disinfection of the soil, and use of special fertilizers, are stated to have been found thus far of negative or at best of doubtful utility. Early removal from the field of tubers from diseased plants and careful culling of seed tubers are recommended as practical measures that are in a degree protective.

The wart disease of potatoes, T. H. Middleton (*Bd. Agr. and Fisheries [London], Ann. Rpt. Intel. Div. 1910–11, pt. 2, pp. 38–54, maps 2*).—The wart disease of potatoes, due to *Synchytrium endobioticum*, is present over a large area covering the west and northwest of England, parts of Wales, and a part of Scotland.

Experiments with about 50 different varieties were carried on in 1910 in different localities to determine their resistance to the disease, with gratifying results. The varieties Langworthy, Conquest, and Golden Wonder were not

at all or only slightly attacked by disease, although the potatoes were planted in soils in which susceptible varieties would not have produced a sound plant. Other varieties contained a certain amount of disease, and the majority were either entirely destroyed or produced very few sound tubers.

Another series of experiments is reported upon in which different soil treatments were tested for the control of the disease, the fungicides used being sulphur, copper sulphate, iron sulphate, Strawsonite, potassium sulphid, etc. In no single plat did the potatoes escape disease, and the number of plants affected was so great that it was not considered worth while to attempt to determine the proportion of affected tubers.

Another experiment was carried on to determine the value of the process of greening the seed potatoes in relation to the disease. It was found that sprouted tubers when planted in soils infected by the fungus were more liable to produce a smaller crop of tubers and were more subject to disease than unsprouted tubers.

Some fungus diseases of the prickly pear, F. A. Wolf (*Ann. Mycol., 10 (1912), No. 2, pp. 113–134, figs. 8*).—The author has during the past 3 years made a study of the common diseases of the prickly pear (*Opuntia lindheimerii*), which is used to some extent in south and southwest Texas as a forage crop. The present report considers the structure, cultural characteristics, and life history of the fungi themselves, also the symptomology and the pathological morphology of the prickly pear.

The fungi most common are stated to be *Sphærella opuntiæ*, causing in its conidial stage (called *Glœosporium lunatum*) an anthracnose; *Perisporium wrightii*, causing the black spot disease; and *Hendersonia opuntiæ*, causing the sun scald of prickly pear. Several other disease-causing fungi of less destructive nature are mentioned.

Infection with *S. opuntiæ* takes place only following the rainy season in the spring, causing a serious rotting of the new and tender joints. *P. wrightii* is the least common and causes the least injury of these three. *H. opuntiæ* is very abundant and destructive. Segments of all ages are affected. The mycelium spreads within the epidermal system, closing the stomata and developing its pycnidia from these stomatal plugs. The scalded appearance is due to the development of suberized tissue as protection from desiccation.

Beet nematodes (Heterodera schachtii), O. Fuchs (*Ztschr. Landw. Versuchsw. Österr., 14 (1911), No. 7, pp. 923–952*).—An account is given of the author's studies on the biology and control of eelworms which attack beets and several other plants. These are said to be migratory and to be carried far and wide in wet weather by moving water, circumstances which increase the difficulties of combating their ravages. The Kühn method of trap-plants is favored but is said to be subject to the drawback that the larvæ remain in the soil to renew the disease thus temporarily checked. Chemical measures have thus far been found ineffective. The plan of heating the soil to the depth usually occupied by the roots to a temperature of 63° C. is said to prove beneficial, but subject to such drawbacks as expense, difficulty of application, etc. A brief bibliography is given.

Tumor formation in sugar beets, K. Spisar (*Ztschr. Zuckerindus. Böhmen, 36 (1911), Nos. 1, pp. 1–17, figs. 6; 2, pp. 57–72, figs. 5*).—This presents the more important results of the author's continuation of previous work (E. S. R., 24, p. 47). The experiments were undertaken with plants in a less advanced stage of development, with a view to testing his assumption, previously stated, that the tumors result from mechanical injury to the roots.

It is claimed that the attempts to produce the tumors by wounding were successful, that these structures develop from wounds in the cambium, and that

the wounded surfaces develop a callous tissue in which may be differentiated the cambium and vascular elements which grow in relation to the corresponding portions of the roots. The tumors require much nutriment, thus hindering the growth of the plant, while these portions, containing little sugar, are either of little or no value or of positive disadvantage to the crop.

Melon or cucumber canker, T. H. MIDDLETON (*Bd. Agr. and Fisheries [London], Ann. Rpt. Intel. Div. 1910–11, pt. 2, pp. 54–56*).—The canker of melons and cucumbers, due to *Mycosphærella citrullina*, has become quite serious in greenhouses in England, although the disease does not appear to attack outdoor plants to any particular extent. The results of the investigations thus far conducted on the spread of the disease and the means for its control have been very unsatisfactory, and, according to the author, these points require additional investigation. There seems to be evidence that the fungus gains entrance to plants through wounds, and one of the worst cases reported occurred on plants that had been topped. In other cases the infection seemed to follow insect punctures.

It is believed that thorough disinfection of houses in winter and spraying with Bordeaux mixture might prove efficient in controlling the trouble.

Collar blight and other collar and root diseases of the apple, M. B. WAITE (*Rpt. W. Va. Bd. Agr., 1912, No. 25, pp. 66–74*).—The author discusses a form of pear blight attacking the apple at the thickened portion of the tree just above and below the ground line. For this form of the disease the name collar blight is given. Methods for the control of the disease are described and attention called to some other diseases resembling this trouble in some respects. One of the most common forms of the disease is due to winter injury, which favors the attack of wood rot fungi and hastens the death of the tree.

Brief notes are also given on the crown gall, woolly aphis, and the fungus root rot.

Pear blight control, E. A. GAMMON (*Mo. Bul. Com. Hort. Cal., 1 (1912), No. 2, pp. 37–41, figs. 3*).—The results of 7 years' active effort in the control of pear blight in a large orchard in California are given. They indicate the necessity of careful pruning and thorough disinfection.

American gooseberry mildew, T. H. MIDDLETON (*Bd. Agr. and Fisheries [London], Ann. Rpt. Intel. Div. 1910–11, pt. 2, pp. 4–27, maps 6*).—The present status of the American gooseberry mildew in Great Britain is discussed. The author states that while this disease is prevalent in certain places in which gooseberry growing is carried on as a commercial industry and has caused serious damage in limited areas, it has not yet spread over the whole kingdom or caused great loss. It is claimed that it may be held in check if proper precautions, such as prompt measures in pruning and spraying, be taken by owners of gooseberry bushes.

Attention is called to the apparent periodicity of the disease in some localities, a severe epidemic one year being followed by a year with little of the disease. This is attributed to the fact that the resting spores of the fungus possibly fail to germinate and carry over to a second season.

The rusts of wild grapes in India, E. J. BUTLER (*Ann. Mycol., 10 (1912), No. 2, pp. 153–158, fig. 1*).—Two species of rusts, said to occur on wild grapes in India, are discussed. One is said to agree closely in description with the previously known *Phacopsora vitis;* the other, claimed to be new, is described under the name *Chrysomyxa vitis*. The first is deemed a very active parasite and a possible source of danger to cultivated vines.

A coconut disease of Mexico, R. OLSSON-SEFFER (*Rev. Trop. Agr., 2 (1912), No. 4, pp. 295, 296*).—Attention is called to a bud rot disease due to a fungus, said to be *Pythium palmivorum*, which kills the coconut trees in patches of 3

or 4, never on a hillside and always on yellowish clay land. The fungus produces two kinds of spores; one suited to very rapid propagation but short lived, the other capable of surviving for months and infecting distant trees. Cool weather with accompanying rain, fog, and dew favor infection; hence outbreaks occur usually and most freely after such seasons.

The treatment recommended is early destruction of all diseased buds and prompt application of fungicides to points of new infection.

A disease of Anthemis, H. BLIN (*Rev. Hort. [Paris]*, *83* (*1911*), *No. 16, pp. 382–384*).—A disease of Anthemis is reported in France which is said to cause considerable losses to the growers in certain regions.

The foliage first turned yellow, then black; finally the stem was affected and the plant withered and died. The roots were found to be more or less covered with nodules ranging in size from that of a pea to that of a plum, and containing 2 nematodes, *Heterodera schachtii* and *H. radicicola*. The dead and dying leaves were covered with a fungus, said to be *Alternaria tenuis*, which, however, is thought to be a weak saphrophyte.

The precise nature and cause of the disease are not yet definitely determined. As treatments, disinfection of the soil with carbon bisulphid, also resting the soil, considerable spacing between the plants, etc., are recommended for the eelworms. For the fungus, Bordeaux mixture applied to the aerial portions is suggested.

A new Marssonina on dill, D. HEGYI (*Kisérlet. Közlem., 14* (*1911*), *No. 4, pp. 595, 596*).—The author describes a disease studied by him on stems, leaves, and flowers of *Anethum graveolens*. He considers it a new species and describes it under the name *M. kirchneri*.

Sweet pea diseases (*Gard. Chron., 3. ser., 51* (*1912*), *Nos. 1308, p. 36; 1309, pp. 52, 53; 1311, pp. 84, 85*).—The author discusses the disease of sweet peas known as the "streak" disease, due to attacks of *Macrosporium solani*. It is believed that the fungus is carried by seed and that the heavy application of fertilizers used to force sweet peas tends to cause the plants to be more susceptible to attacks of the fungus. The reduction of the large amount of nitrogenous fertilizers, better attention to the preparation of the soil, and the use of sound seed are recommended as means for the prevention of the trouble. Spraying may be resorted to in severe cases, but the foliage sheds the fungicide badly. Treating seed with a potassium permanganate solution is also advised.

The war on the chestnut blight, S. B. DETWILER (*Country Gent., 77* (*1912*), *No. 13, pp. 8, 27, fig. 1*).—A résumé is given of the papers and discussions at the interstate conference held at Harrisburg, Pa., in February to consider the best methods of dealing with the chestnut bark disease. Delegates were in attendance from Maine, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, West Virginia, Ohio, Tennessee, North Carolina, and the Dominion of Canada. Resolutions were adopted recommending prompt and vigorous methods for locating and stamping out the disease in each State so far as practicable. It was also recommended that a quarantine be maintained and that the utilization of diseased chestnut timber be stimulated.

Protection of woods by solutions from injurious fungi, and studies on forms of Ceratostomella and Graphium, CAROLINE RUMBOLD (*Naturw. Ztschr. Forst u. Landw., 9* (*1911*), *No. 10, pp. 429–467, pls. 3; abs. in Mycol. Centbl., 1* (*1912*), *No. 3–4, pp. 115, 116*).—In continuance of previous work with wood-injuring fungi (E. S. R., 25, p. 755), the author gives tabulated results of tests of several solutions found to be protective at different strengths. Descriptions are given also of Ceratostomella and Graphium as affected by different life conditions. Great variations are said to be observable and are pointed to as

presenting difficulties in identification of the species, or in recognition of development stages thereof.

Studies in dry rot.—I, The biology of Coniophora cerebella, C. WEHMER (*Mycol. Centbl., 1 (1912), No. 1, pp. 2–10, figs. 4*).—This important fungus is of very luxuriant growth, especially in quiet, moist air. It attacks wood of several sorts besides conifers, notably the beech (but not oak), and many other materials, as linen, paper, cotton, etc., which serve as a basis for its development. Its physical characteristics, modes of growth, nutrient relations, and descriptions of its spores are given in some detail.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Some common game, aquatic, and rapacious birds in relation to man, W. L. MCATEE and F. E. L. BEAL (*U. S. Dept. Agr., Farmers' Bul. 497, pp. 30, figs. 14*).—Attention is called to the fact that water birds, such as grebes, gulls, and terns, are of greater economic value and do less harm than is ordinarily supposed, while some species, like Franklin's gull and the black tern, are markedly beneficial by their destruction of insects. It is also pointed out that many birds of prey are exceedingly valuable to the farmer, although the opposite is true of Cooper's hawk, the sharp-shinned hawk, and the goshawk, all of which should be destroyed as the determined foes of poultry, game birds, and most of the smaller insectivorous species.

Those here dealt with are the prairie chicken (*Tympanuchus americanus*), California quail (*Lophortyx californica*), ruffed grouse (*Bonasa umbellus*), introduced pheasants (*Phasianus torquatus* and *P. colchicus*), upland plover (*Bartramia longicauda*), killdeer (*Oxyechus vociferus*), horned grebe (*Colymbus auritus*), Franklin's gull (*Larus franklini*), terns (*Sterna maxima, S. forsteri, S. hirundo, S. antillarum,* and *Hydrochelidon nigra surinamensis*), Cooper's hawk (*Accipiter cooperi*), rough-legged hawk (*Archibuteo lagopus sanctijohannis*), sparrow hawk (*Falco sparverius*), long-eared owl (*Asio wilsonianus*), and screech owl (*Otus asio*).

"All the shore birds are strikingly beneficial in their food habits, and the slaughter of these game birds deprives the farmer of valuable allies against some of the worst crop pests. . . . The gallinaceous game birds, as quail, grouse, and pheasants, take far less insect food than the shore birds, yet all of them do a certain amount of good. . . . The hawks and owls have a bad name, but for the most part it is undeserved, and indiscriminate persecution of these birds is a serious mistake."

Migration of the Pacific plover to and from the Hawaiian Islands, H. W. HENSHAW (*Auk, 27 (1910), No. 3, pp. 245–262; Ann. Rpt. Smithsn. Inst., 1910, pp. 545–559*).—This paper presents facts relating to the migration of the Pacific plover (*Charadrius dominicus fulvus*), which were gathered in the Hawaiian Islands from 1894 to 1904, together with certain deductions therefrom.

Third annual report of the state ornithologist, E. H. FORBUSH (*Agr. of Mass., 58 (1910), pp. 165–197, pl. 1*).—Among the subjects considered in this report are the following: Destruction of song birds by aliens; birds feeding on the eggs of the gipsy moth; European methods of attracting birds; and the starling in Europe and America, its food, increase and dissemination, habits of driving certain native birds from their nests, etc.

Digest of the game, fish, and forestry laws, 1911, edited by J. KALBFUS (*Harrisburg, Pa.: State, 1911, pp. 290*).—This digest includes indexes to the laws.

Notes on the mammals of the Lake Maxinkuckee region, B. W. EVERMANN and H. W. CLARK (*Proc. Wash. Acad. Sci., 13 (1911), No. 1, pp. 34*).—Observations of 31 forms in the region of Lake Maxinkuckee, a glacial lake about 2¾ miles long and 1½ miles wide in the southwest corner of Marshall County, Ind., are here reported.

Destruction of rats in Japan (*Daily Cons. and Trade Rpts. [U. S.], 15 (1912), No. 82, p. 86*).—A bounty of 2½ cts. gold per head offered by the city of Kobe was claimed for 354,291 rats killed during 1911.

Text-book of protozoology, F. DOFLEIN (*Lehrbuch der Protozoenkunde. Jena, 1911, 3. enl. ed., pp. XII+1043, figs. 951; rev. in Amer. Nat., 46 (1912), No. 545, pp. 308, 309*).—A third enlarged edition (E. S. R., 23, p. 357).

Observations upon the morphology of parasitic and cultural amebæ, C. F. CRAIG (*Jour. Med. Research, 26 (1912), No. 1, pp. 1–37, pls. 2*).—The author finds that the organisms here considered, namely, *Entamœba coli*, *E. histolytica*, *E. tetragena*, and *Amœba lobospinosa* n. sp., differ greatly in morphology and life history, and that each possesses characteristics which entitles it to specific rank.

Report of the dominion entomologist, C. G. HEWITT (*Canada Expt. Farms Rpts. 1911, pp. 207–235, pls. 3, figs. 3*).—This report includes the text and regulations of the destructive insect and pest act of 1910 and accounts of the brown-tail and gipsy moths, fumigation with hydrocyanic acid gas, insects affecting live stock, particularly the warble fly (*Hypoderma lineata*) and ticks (*Dermacentor albipictus*) on horses, thrips (thought to be *Anaphothrips striatus*) attacking cereals, the white-marked tussock moth, and the narcissus fly (*Merodon equestris*). The narcissus fly is now a serious pest in British Columbia, some 50,000 narcissus and daffodil bulbs having been destroyed near Victoria during the year. The author states that he has found the larvæ of this pest present in bulbs imported into Ontario from Holland.

Brief notes on the more important insects reported to the division of entomology during the year are arranged under the headings of insects affecting field and root crops, fruit and fruit trees, forest and shade trees, and garden and greenhouse. The apicultural work of the year is also noted.

The discovery in 1911 of winter webs of the brown-tail moth at Pomeroy Ridge, Charlotte County, New Brunswick, is said to be the first conclusive evidence of the establishment of this pest in New Brunswick.

Report of field entomologist, G. P. WELDON (*Colorado Sta. Rpt. 1911, pp. 32–34*).—In experiments at Rifle both fall and spring applications of lime-sulphur while the trees were dormant controlled the peach twig borer. The tobacco preparations Blackleaf and Blackleaf 40 were also used in the experiments but proved to be of little value in controlling this pest.

Arsenite of zinc is said to have given promising results in the control of the codling moth, in some cases doing better work than arsenate of lead. Experiments indicate that but little can be accomplished in applying a fall spray for the green peach aphis, unless the application be made very late in the season after the eggs have all been deposited.

Trichogramma pretiosa, which was found in abundance the previous year and parasitized as high as 90 per cent of the codling moth eggs, is said to have almost totally disappeared during the season of 1911.

Report of entomologist, E. W. BERGER (*Florida Sta. Rpt. 1911, pp. XL–LVII*).—The author first gives a brief report of the status of fungus diseases of white fly during the year, based on observations at Gainesville, New Smyrna, De-Land, Winter Park, St. Petersburg, the Sub-Peninsula, etc. This is followed by brief accounts of the culture of red Aschersonia; germination tests of red and yellow Aschersonias; the preservation of fungus in cold storage; soap and

spraying mixtures; weight of white fly pupæ; the woolly white fly; migration of white fly; and scale insects.

Whale-oil soap was found to be a satisfactory agent for use in softening water for use with kerosene emulsion, white fly formula IV, a proprietary emulsion, and a proprietary miscible oil. Some good results were obtained from the use of sodium carbonate in softening water, especially when the mixture of water and soda was allowed to stand for about one-half hour. Borax gave no beneficial results, the oil rising to the surface as readily as when no softening agent had been added.

Applications of lime-sulphur and soda sulphur 1:30 to white fly larvæ in all stages proved ineffective. Tests of the effect of various insecticides on white fly eggs are reported in tabular form. In order to obtain a more adequate idea of the actual drain of the white fly upon the trees, weighings of the nearly mature pupæ were made during March. It is estimated that 1,000,000 pupæ would weigh 67.8 gm. and that this number of larvæ would excrete in a month 15 lbs. of honeydew.

The rufous scale (*Aspidiotus articulatus*) was found to infest a grove near Largo.

Combating scale and other insects, L. Trabut (*Bul. Agr. Algérie et Tunisie, 16 (1910), Nos. 7, pp. 149–158; 10, pp. 225–234; 12, pp. 281–293; 16, pp. 377–388; 17, pp. 401–412; 22, pp. 517–528; 17 (1911), Nos. 7, pp. 163–172; 8, pp. 186–202; 9, pp. 224–236; 10, pp. 255–265; 14, pp. 353–360, figs. 127*).—This article is devoted largely to the Coccidæ, but also briefly considers thrips, red spiders, and other mites, Aleyrodes, etc., their parasitic and predaceous enemies, and artificial means of control.

The insect enemies of the prickly pear, H. Tryon (*Queensland Agr. Jour., 27 (1911), No. 2, pp. 80–83*).—A brief account of the Australian and extra Australian insect enemies of *Opuntia* spp.

Combating the insect enemies of the olive (*Bul. Mens. Off. Renseig. Agr. [Paris], 11 (1912), No. 1, pp. 29–38, pl. 1, figs. 3*).—This is a report of experiments conducted by the Oleaculture Service in combating the olive fly (*Dacus oleæ*), the olive miner (*Tinea oleæ*), and the olive scale (*Lecanium oleæ.*)

The enemies of the coconut palm (*Bul. Agr. Congo Belge, 2 (1911), Nos. 3, pp. 512–528, figs. 15; 4, pp. 723–731, figs. 4*).—This is a brief account of the insect and other animal enemies and of the diseases of the coconut palm.

Termite studies, N. Holmgren (*K. Svenska Vetensk. Akad. Handl., 44 (1909), No. 3, pp. 215, pls. 3, figs. 76; 46 (1911), No. 6, pp. 86, pls. 6, figs. 6*).—The first part of this work is devoted to the gross and microscopic anatomy and embryology of termites; the second part deals with the classification of the families Mastotermitidæ, Protermitidæ, and Mesotermitidæ.

Grasshopper disease, W. G. Sackett (*Colorado Sta. Rpt. 1911, p. 20*).—In experiments carried on with a fungus disease, which has appeared sporadically with more or less varying degrees of virulence and has been prevalent among grasshoppers in Colorado, attempts to infect artificially failed. In these experiments grasshoppers were fed with the fungus, a pure culture was spread upon their bodies, and healthy individuals were placed in breeding cages with grasshoppers suffering from or dead of the disease. Pure cultures of the supposed causal fungus have been isolated and attempts have been made to produce on culture media some unusual form of the fungus with which to infect grasshoppers the following season.

On the propagation of the Mexican locust epizootic in Argentina, F. d'Herelle (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 9, pp. 623–625*).—Cultures of *Coccobacillus acridiorum* n. sp., the bacterium that was found to destroy locusts (*Schistocerca cancellens*) in Yucatan, as previously noted

(E. S. R., 26, p. 246), have been used by the author with success in destroying crickets and locusts (*S. paranensis*) in the Province of Santa Fé, Argentina. The epizootic spreads with remarkable rapidity, the disease having been reported from a radius of 50 km. (about 31 miles) about the district first infected within a few days after the first infestation.

It is stated that the Argentine government has decided to employ this means of combating locusts in all the infested territory.

The destruction of locusts by Herelle's method, R. GUÉRIN (*Jour. Agr. Trop., 12 (1912), No. 129, pp. 70–72*).—This paper relates to the investigations noted above.

How to fight the pear thrips, G. E. MERRILL (*Mo. Bul. Com. Hort. Cal., 1 (1912), No. 2, pp. 51–59, figs. 3*).—This is a general account of the pear thrips, its life history, injury, and control measures.

Excellent results are said to have been obtained from the application of a spray of whitewash, consisting of from 75 to 100 lbs. of lime to each 100 gal. of water. It is stated that the cost of the spray should not exceed more than 1 ct. per gallon of prepared material. Care should be taken to secure first-class lime and to see that it is well slaked. The spray should be applied just as the buds begin to separate and the entire surface of the tree should be covered, one application being sufficient.

Eight times as many pears were obtained from trees sprayed in this way as from unsprayed trees.

Scale insects and black blight, G. AUCHINLECK (*Imp. Dept. Agr. West Indies, Rpts. Bot. Sta. [etc.] Grenada, 1910–11, p. 15*).—The shield scale fungus (*Cephalosporium lecanii*) was found early in 1910 destroying *Coccus mangiferæ* in the botanic gardens in Grenada. It has since been distributed throughout the island on mango leaves. The spread of Cephalosporium in 1910 and the earlier part of 1911 is reported to have been extraordinarily rapid and it is now present in nearly all the districts of the island, it being difficult to find a mango tree in Grenada on which the scales are not parasitized by this fungus, or which is not clean of black blight.

The red headed fungus (*Sphærostilbe coccophila*) has been used in connection with scales on citrus trees but so far without success.

European elm scale in California, C. W. WOODWORTH (*Mo. Bul. Com. Hort. Cal., 1 (1912), No. 3, p. 101*).—This species is said to occur in great abundance in Stockton, Colusa, Palo Alto, Santa Clara, San José, and Ukiah.

African scale insects, L. LINDINGER (*Jahrb. Hamburg Wiss. Anst., 26 (1908), Beiheft 3, pp. 13–46, figs. 24; 27 (1909), Beiheft 3, pp. 33–48, pls. 4; 28 (1910), Beiheft 3, pp. 1–38, pls. 3, figs. 16; Stat. Pflanzenschutz Hamburg [Ber.], 11 (1908–9), pp. 13–46, figs. 24; 12 (1909–10), pp. 33–48, pls. 4; pp. 1–38, pls. 3, figs. 16*).—Four papers are presented, namely, (1) Diaspinæ from Kamerun, including descriptions of a new genus (Cryptodiaspis) and 20 new species; (2) a South African diaspid resembling the San José scale, namely, *Aspidiotus pectinatus* n. sp.; (3) Coccidæ from East Africa, with descriptions of a genus (Cryptaspidus), 10 species, and 1 variety, all new to science; and (4) Coccidæ of the Canary Islands, a contribution to the fauna of the islands. Thirty-nine species of scales are recorded from the Canaries of which 12 are described as new to science.

Control of the codling moth in Arizona with special reference to the Upper Gila Valley, A. W. MORRILL (*Ariz. Hort. Com. Circ. 15, 1910, pp. 8*).—This circular briefly describes methods of dealing with the pest.

Revision of the oriental Tipulidæ with descriptions of new species, E. BRUNETTI (*Rec. Indian Mus., 6 (1911), No. 5, pp. 231–314*).—This work includes descriptions of 8 genera and more than 50 species new to science.

A revision of the oriental species of the genera of the family Tabanidæ other than Tabanus, GERTRUDE RICARDO (*Rec. Indian Mus., 4 (1911), No. 8, pp. 321–397, pls. 4*).—"The genera found in the oriental region, besides the large genus of Tabanus proper, are: Hæmatopota, Meigen, small flies with peculiarly marked wings; Udenocera, Ricardo, formed for a species from Ceylon with the long antennæ situated on a tubercle; Diachlorus, Macquart, including chiefly species from South America, distinguished by the simple antennæ not situated on a tubercle, by the brown or yellowish markings of the wings and by the curved dilated fore tibiæ, and slender build. One species described from the Philippines is unknown to me. A new genus Neotabanus is now added, allied to Udenocera in having the antennæ situated on a tubercle, but the antennæ themselves are similar to those of the genus Tabanus."

Investigations covering the Mediterranean fruit fly (Ceratitis capitata) in the Hawaiian Islands, E. K. CARNES (*Mo. Bul. Com. Hort. Cal., 1 (1911), No. 1, pp. 5–13, figs. 2*).—The author, who was detailed by the state commissioner of horticulture of California to make an investigation of the infestation in the Hawaiian Islands, to study the life history and habits of the pest, and to work out a plan for its eradication in case the pest should gain entrance and appear in California, here presents a preliminary report. Opportunity is taken to give a summarized account of the pest, its life history, habits, and injury.

Another mango pest in the Philippines, P. J. WESTER (*Philippine Agr. Rev. [English Ed.], 4 (1911), No. 12, pp. 649–652, pl. 1*).—A fruit fly, probably *Dacus ferrugineous*, destructive to the mango in Java and other parts of Malayasia, is said to have been found in 4 Provinces in Luzon. The author's attention was first drawn to this pest on May 13, 1911, at the Lamo Experiment Station, Bataan.

A note on the habits of the narcissus fly, F. J. CHITTENDEN (*Jour. Roy. Hort. Soc. [London], 37 (1911), No. 1, pp. 122, 123*).—The author finds that the narcissus fly (*Merodon equestris*) does not restrict its attacks to narcissus, bulbs of *Habranthus pratensis*, from Holland, and *Vallota purpurea*, from Sierra Leone, having been found to contain larvæ of this pest.

First annual report of the state inspector of apiaries, B. N. GATES (*Agr. of Mass., 58 (1910), pp. 199–217, pls. 2*).—In this report the author briefly discusses brood diseases of bees, the usefulnes of bees to the agriculturist, importance of inspection of the apiary, etc.

Pollination of red clover by bumblebees, E. LINDHARD (*Tidsskr. Landbr. Planteavl, 18 (1911), No. 5, pp. 719–737, figs. 2*).—The author presents a résumé of investigations on this subject, and his own observations which lead him to conclude that the honeybee may occasionally aid in the pollination of clover blossoms. Tables state the results of observations made on the work of *Bombus hortorum, B. subterraneus, B. distinguendus, B. lapidarius, B. terrestris, B. silvarum, B. arenicola, B. muscorum*, and *Apis mellifica*.

The natural history of the solitary wasps of the genus Synagris, E. ROUBAUD (*Ann. Soc. Ent. France, 79 (1910), I, pp. 1–21, pls. 4; Ann. Rpt. Smithsn. Inst., 1910, pp. 507–525, pls. 4*).—This paper relates to solitary wasps of the subfamily Eumeninæ, which inhabit all of Africa except the northern portion and Egypt.

The Ichneumons of Great Britain, C. MORLEY (*London, 1911, vol. 4, pp. XVI+344, pl. 1, figs. 41*).—This fourth volume (E. S. R., 22, p. 159) deals with the Tryphoninæ, of which the author recognizes 49 genera and 334 species as occurring in Great Britain.

Technical results from the gipsy moth parasite laboratory.—V. Experimental parasitism: A study of the biology of Limnerium validum, P. H.

TIMBERLAKE (*U. S. Dept. Agr., Bur. Ent. Bul. 19, pt. 5, tech. ser., pp. 71–92, figs. 10*).—"*L. validum*, a common parasite of the fall webworm (*Hyphantria cunea*), readily attacks the caterpillars of the brown-tail moth, gipsy moth, and rusty vaporer moths [*Notolophus antiquus*], and also the tent caterpillar, when placed in confinement with these hosts, but is able to complete its transformations in the last species only and even then in but a small percentage of cases. Its larvæ seem to be totally unadapted for life in the caterpillars of the 3 former species, and fail to survive the protective reactions of the host, which are visibly manifested by an accumulation of active blood cells or amœbocytes around the larvæ, the cast eggshells, and even the eggs themselves. The amœbocytes presumably attack the living eggs and larvæ, or at least ultimately efface the latter entirely. The same reaction takes place in the case of the tent caterpillar, but a few of the larvæ are able to complete their transformations. Adaptation here is partially in evidence, and may be due to larval secretions which ward off the protective reactions of the host. . . .

"During its whole life the larva feeds on blood and lymph and on small solid particles which result from the disintegration of the host's tissues, probably pathologically induced by some larval secretion. There is no evidence to show that such definite organs of the host as the digestive tube and muscular tissue can be consumed by the larva unless they are broken down, inasmuch as the mouth parts of the larva throughout life are essentially sucking.

"Under artificial conditions the minimum time needed for the development of the insect from the egg to the adult was found to be about 50 days, but the maximum time may be extended many months. Under natural conditions in the Northern States as a parasite of Hyphantria, the females are probably active in parasitizing the caterpillars throughout the month of August and the first part of September. The larvæ issue from the caterpillars and spin their cocoons during September and the first part of October, but the cocoons always overwinter, and the adults emerge the following summer."

A bibliography of 10 titles is appended.

The southern corn root worm in South Carolina (Diabrotica 12-punctata), W. A. THOMAS (*South Carolina Sta. Bul. 161, pp. 3–6, pl. 1*).—This bulletin gives a brief account of the life history and remedial measures for the southern corn root worm, or so-called budworm of corn, based upon observations made by the author in eastern South Carolina while prosecuting studies of the cotton root louse in cooperation with the Bureau of Entomology of this Department.

At Marion the first eggs were deposited on March 10 and had hatched by April 2. The larvæ had all formed earthen cells in which to pupate, or transformed to adult beetles by May 5, and the fully developed beetles had all emerged by May 24. During the winter there is no complete hibernation of the beetles in the vicinity of Marion; at the approach of severe cold, they find shelter beneath the leaves of weeds in the fields and in other protected places until it becomes warmer, whereupon they again begin feeding.

The most practical means of controlling this pest is through cultural operations. The planting of corn on low moist bottom lands, to which the pest confines its ravages almost entirely, should be delayed until the larvæ have begun to pupate. The approximate dates for planting corn in the various sections of the State in order to escape the injury occasioned are set as May 5 for lower South Carolina, May 12 for middle South Carolina, and May 19 for the Piedmont Region.

Locomotion of the larva of Calosoma sycophanta, A. F. BURGESS (*Ann. Ent. Soc. Amer., 4 (1911), No. 2, pp. 173–179, pl. 1, figs. 2*).—This is a somewhat

more detailed account than that presented in the bulletin previously noted (E. S. R., 26, p. 350). The apparatus used is described and illustrated.

The distance traveled by a newly hatched larva from 8.30 Saturday morning until its death at 8.45 Tuesday morning, of which time the larva was actually on the recording paper about 70 hours, amounted to 9,058 ft., or 1.71 miles. "The highest rate of travel per minute was during the first 4½ hours, and averaged 4.9 ft. For the first 24 hours the average was 3.69 ft. per minute; during the next 8 hours the average dropped slightly and for the remaining period the average was gradually reduced until the larva died. . . . For the first 36 hours the larva traveled almost continuously, stopping only occasionally for a minute or so to rest. . . . Although the distance traveled is probably much greater than what would actually occur in nature, it is remarkable that so much latent energy can be stored up in an egg of one of these beetles."

"The length of life of the insect is also worthy of note when it is remembered that no food or water was supplied, as it indicates that the young larvæ are able to survive several days in the field without food and still have sufficient vitality to make a thorough and active search for their prey."

Collecting ladybirds (Coccinellidæ) by the ton, E. K. CARNES (*Mo. Bul. Com. Hort. Cal., 1 (1912), No. 3, pp. 71–81, figs. 7*).—This is an account of the work conducted in California, where each year several tons of coccinellids of the species *Hippodamia convergens* are collected and distributed to growers of cantaloups, prunes, apples, pears, vegetables, seeds, and garden truck for the destruction of aphids, even including city street trees and home gardens. "Starting about November 1, the field men go up into the mountains to locate the hibernating colonies, which are usually found among pine needles on sunny, well drained slopes, usually in close proximity to running water. . . . By this time the ladybirds have begun to arrive in the mountains and to assemble in colonies on the stems and about the roots of low growing plants, previous to seeking winter shelter of the pine needles, where they are securely hidden." The collecting of lady beetles commences the last of December and continues until the last of February. Two men usually work together, and with fairly good success collect from 50 to 100 lbs. of beetles in a day.

In order to avoid the heavy expense of artificial cold storage, the beetles are kept at the mountain packing house as long as possible and are then transferred to a large cold storage room rented from a commercial company at Sacramento, and kept at a temperature of slightly under 40° F.

Notes on the Ixodidæ of Brazil, H. DE BEAUREPAIRE ARAGÃO (*Mem. Inst. Oswaldo Cruz, 3 (1911), No. 2, pp. 145–195, pls. 2*).—This paper includes tables for the separation of 46 species of ticks occurring in Brazil, a list of their hosts, and their geographical distribution. Ten forms are considered, 3 of which, *Ornithodoros rostratus*, *Amblyomma pacæ*, and *Hæmaphysalis leporis proxima*, are described as new to science.

Notes on the genus Rhipicephalus, with the description of new species, and the consideration of some species hitherto described, C. WARBURTON (*Parasitology, 5 (1912), No. 1, pp. 1–20, figs. 12*).—Three species and 1 variety are described as new to science.

Notes on ticks.—II, New species (Amblyomma, Hæmaphysalis); Ixodes putus: Description of the hitherto unknown larval stage, G. H. F. NUTTALL (*Parasitology, 5 (1912), No. 1, pp. 50–60, figs. 9*).—This paper includes descriptions of 3 species new to science, namely, *Amblyomma darlingi*, taken from a deer (*Odocoleus* sp.) and a turkey buzzard (*Catharista atratus*) in the Canal Zone; *Hæmaphysalis warburtoni*, and *H. montgomeryi*.

FOODS—HUMAN NUTRITION.

Report of the commission to investigate the subject of the cold storage of food and of food products kept in cold storage (*Boston: State, 1912, pp. 398, chart 1*).—After an exhaustive study of the subject the commission reached a number of conclusions and made recommendations.

"In general, the commission recognizes that cold storage is a fundamental necessity in the distribution of the food supply of the nation. In the first place, it enables perishable food products to be brought to market with the least possible deterioration; in the second place, it enables the surplus of such products in the season of natural plenty to be carried over to meet the demand in the season of natural scarcity. The latter is the principal economic function of cold storage. It acts as a means of distributing the seasonal output of perishable foodstuffs evenly over the market year, thus helping to equalize supply and demand."

The general conclusions reached are thus summarized:

"A progressive deterioration takes place in perishable food products kept in cold storage; the changes naturally occurring are greatly retarded by refrigeration, but are not absolutely suspended. Therefore, a food product that has been held in cold storage is never just as good as the perfectly fresh article, other conditions being equal.

"The deterioration taking place during cold storage first appears in a change in flavor, which may affect the palatability of the food, but does not necessarily affect its wholesomeness or nutritive value.

"The length of time during which an article of food held in cold storage can be kept wholesome and fit for consumption varies for different commodities. The period of proper preservation for any particular commodity depends largely on the methods of handling and preparing for cold storage. Scientific investigation in this field has not yet been carried far enough to enable one to fix normal time limits of cold storage for different commodities.

"On the whole, prolongation of cold storage beyond one year, even under correct conditions, appears to be undesirable, and prejudicial to the public health."

With respect to regulation, the commission recommends:

"Cold storage warehouses should be subject to the supervision of the state board of health, and should be required to take out licenses and submit regular reports. The main object of the proposed inspection is to ensure the proper condition of goods upon entry into storage and their proper treatment during the storage period.

"Food products deposited in cold storage should be marked with the dates of receipt into storage and of withdrawal from storage. . . .

"The time for which food products may be held in cold storage should be limited to 12 months, with discretionary power vested in the state board of health to extend the time limit for particular consignments of goods, and also to fix a shorter time limit than 12 months for any article of food, if such further restriction of the storage period should be found upon investigation to be desirable. . . .

"The fraudulent sale of cold storage products as fresh goods should be prohibited. It is generally admitted that the purchaser has a right to know whether he is getting cold storage or fresh food. . . .

"The return to cold storage of goods that have once been withdrawn and placed on the market for sale to consumers should be prohibited. Such goods are presumably not in fit condition for further storage. The prohibition of

restorage is needed to protect consumers against a practice that unquestionably leads to abuses."

A dissenting opinion is presented by two of the commission with reference to the marking on each package of the date of delivery by cold storage companies.

Supplying a large city with foodstuffs, with particular reference to market conditions in Berlin, E. LANGE (*Staats u. Sozialwiss. Forsch., 1911, No. 157, pp. VIII+83*).—Statistical and other data are summarized and discussed, and a bibliography is provided.

The preparation of Westphalian hams (*Jour. Roy. Soc. Arts, 60 (1912), No. 3092, p. 416*).—Juniper is used in smoking the meat, the twigs and berries being thrown into a beech wood fire. The juniper imparts a distinctive flavor, it is believed. The smoking process requires on an average about 8 days.

A protein body in Liebig's meat extract, K. MAYS (*Hoppe-Seyler's Ztschr. Physiol. Chem., 78 (1912), No. 1, pp. 37–52*).—The author has isolated and determined the properties of a body present in meat extract which he concludes to be a proteid.

Since the extract is used in small quantities at a time and as a condiment and stimulant, the presence of a small proportion of protein, in the author's opinion, has no special importance from the standpoint of nutritive value. On the other hand, he believes that it is an essential constituent since it favorably influences the consistency of the meat extract.

The chemical composition of human milk as shown by recent analyses, E. SCHLOSS (*Monatsschr. Kinderheilk., 9 (1910–11), pp. 636–640; abs. in Zentbl. Expt. Med., 1 (1912), No. 1, p. 14*).—Contrary to the generally accepted opinion, the author maintains that human milk has a constant composition. The fat content varies, but all the other ingredients maintain a definite relation. He presents a compilation of 8 analyses.

Influence of age on wheat and flour, F. T. SHUTT (*Canada Expt. Farms Rpts. 1911, pp. 168–171*).—Continuing earlier work (E. S. R., 24, p. 465), the composition and bread making quality of wheat stored for 2 years were studied.

In general, no differences or changes were noted in chemical composition of the samples stored as flour, though there was a tendency in the gliadin and the gliadin ratio to increase. Conclusions regarding the gluten were not drawn.

Five of the 7 samples stored as wheat showed slight increases in protein content; the gliadin values were very similar to those obtained in the earlier work.

A consideration of the nitrogen-and-ash-free extract and the volume of the loaf did not indicate that there was any relationship between these values, the contention that the volume of the loaf increases with the amount of extract not being supported by the data reported. Furthermore, no relationship was noted between the ratio of soluble ash to total nitrogen and the shape of the loaf.

Chemical analysis and composition of imported honey from Cuba, Mexico, and Haiti, A. H. BRYAN, A. GIVEN, and S. SHERWOOD (*U. S. Dept. Agr., Bur. Chem. Bul. 154, pp. 21*).—The results are reported and discussed, in comparison with American honeys, of 33 samples of Cuban, 23 samples of Mexican, and 16 samples of Haitian honeys. The methods followed in the investigation are described.

According to the authors' summary, the results seem to show that "beyond a slightly greater moisture content and a somewhat lower percentage of sucrose there are no pronounced differences in chemical composition between the honeys of America and those from the countries specified. Other points, however, must be considered."

Attention is directed to the fact that American foul brood is prevalent in Cuba and that while honey from infected colonies of bees is not injurious to human beings, the danger to bees constitutes a serious objection to the unguarded importation of Cuban honeys and affords an additional reason for barring from importation undesirable Cuban honeys.

Furthermore, as pointed out by the authors, "the preparation of the honey for shipment was very poor. The extraction had been carelessly carried out, and much dirt was present in the samples as received. . . . The honey is mostly wild or that from wild bees, is scooped out of the trees by the natives, allowed to drain through coarse cloth, and shipped either in tins or barrels. In only two cases was the product such as could be sold for direct consumption, these two being comb honey.

"Again, with few exceptions the flavor was rank and strong, so that it could hardly be considered palatable. There is some honey of good flavor produced in these places, but it is not exported in any quantity.

"Considering the physical condition of the samples as received in nearly all cases, it can be said that they were not fit for human consumption. Reextraction, straining, etc., might improve this condition, but it is a question whether even under this treatment the honey is made fit for table use, as the dirt has become so intimately mixed as not to be removed by physical means."

A bibliography of chemical literature of honey from 1907 to 1911, compiled by A. H. Bryan, is appended to the report, and supplements earlier compilations (E. S. R., 19, p. 1058).

The nitrogenous constituents of fungi, CAMILLE REUTER (*Hoppe-Seyler's Ztschr. Physiol. Chem., 78 (1912), No. 3–4, pp. 167–245*).—In addition to an exhaustive summary of data previously published, the author reports the results of extended investigations.

The hydrolysis of protein from fungi yielded the following amino acids: Glycocoll, alanin, valin, leucin, phenylalanin, prolin, aspartic acid, and glutaminic acid. Especially to be noted is the high content of the two low amino acids and prolin. After digestion with trypsin tyrosin was found. From dried fungi the following bases or amino acids were isolated: Guanin, adenin, hypoxanthin, trimethylhistidin, cholin, trimethylamin, putrescin, guanidin, phenylalanin, leucin, and racemic alanin. Especially noteworthy is the occurrence of racemic alanin, which constitutes the greater portion of the free amino acids present.

As the author points out, cases of poisoning often occur after eating edible fungi which are attributed to the formation of toxic compounds by bacteria. It is also possible that in processes of digestion substances with marked physiological properties such as agmatin, paraoxyphenyläthylamin, and imidazolyläthylamin are formed by cleavage from the amino acids and bases primarily formed from the protein.

In the author's opinion it would be especially important from a biological standpoint to study the ferments present in fungi which induce carbohydrate cleavage and play a very important rôle in the formation of the simple plant bases which are physiologically active.

The presence of glutaminic acid in preserved tomatoes, N. MONTI (*Staz. Sper. Agr. Ital., 44 (1911), No. 11–12, pp. 813–823; abs. in Chem. Zentbl., 1912, I, No. 7, p. 501*).—By a method which he describes the author isolated glutaminic acid from preserved tomatoes, the quantity being in the proportion of 80 gm. per 60 kg. of material.

[Food inspection and other pure food and drug topics], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul., 2 (1912), No. 4, pp. 49–55, 58–80*).—The results of the examination of a number of miscellaneous food

products as well as the results of a study of headache powders are reported. Some data are given regarding lard and lard substitutes and other food and drug matters.

Notice of judgment (*U. S. Dept. Agr., Notice of Judgment 1455, pp. 57*).—This notice of judgment has to do with the alleged adulteration and misbranding of coca cola. Some analytical data are included.

Food values—practical tables for use in private practice and public institutions, E. A. LOCKE (*New York and London, 1911, pp. VII+110*).—In this small volume the author has briefly discussed foods and their uses and similar topics and has presented a large amount of data in tabular form, including the equivalents of weights and measures used in connection with foods and dietetics, the composition of prepared and cooked foods and of alcoholic beverages, and the average composition of American foods in general.

As the author states in his preface, "information has been drawn largely from the numerous reports of investigations made under the direction of the United States Department of Agriculture."

The book is provided with an index.

Directions for preparing diet for health and disease, G. REYMANN (*Diätetische Kost-Vorschriften, zum Gebrauch in gesunden und kranken Tagen. Lauterecken, 1911, pp. 411*).—General questions of dietetics are discussed and lists are given of the foods in season during different months of the year, together with a large number of recipes and a collection of menus for normal diet and for diet for diabetics and those suffering from liver, kidney, and nervous diseases, from gout, from obesity, and from diseases of the digestive tract, the various diets being arranged in parallel columns. A large number of menus for different seasons are also presented, as well as menus for special occasions.

A bibliography is given of books which the author considers useful, and a list of German periodicals which deal with the preparation of food and similar topics.

[Artificial feeding and poverty and the rate of infant mortality], M. GREENWOOD and J. W. BROWN (*Jour. Hyg. [Cambridge], 12 (1912), No. 1, pp. 5–45*).—The authors discuss particularly the effects of artificial feeding and poverty upon birth-rate and infant mortality. Of special interest is the discussion of the handling and use of statistical data. A bibliography is included.

Concerning the influence of the extractives of meat upon the digestibility of vegetable food, H. WOLFF (*Ztschr. Klin. Med., 74 (1912), No. 3–4, p. 303; abs. in Zentbl. Biochem. u. Biophys., 13 (1912), No. 1–2, p. 21*).—From experiments which were made with dogs the author concludes that the addition of meat extract favorably influenced digestion and nitrogen metabolism.

The increased fat excreted in the feces when meat extract was taken is thought to be fat produced by the organism as a result of stimulation by meat extract and not as undigested from the diet.

The effect of a diet of polished rice on the nitrogen and phosphorus of the brain, C. FUNK (*Jour. Physiol., 44 (1912), No. 1–2, pp. 50–53*).—Experiments were made to ascertain whether differences could be detected between the contents of nitrogen and phosphorus in the brains of normal pigeons and those suffering from polyneuritis, produced by a diet of polished rice.

"The analysis of the brains shows a sensible diminution from the normal of nitrogen and phosphorus content, in a proportion which suggests a breakdown of the lipoids of the brain."

The physiological effect of benzoic acid and sodium benzoate, V. GERLACH (*Physiologische Wirkungen der Benzoesäure und des benzoesauren Natron. Wiesbaden, 1909, pp. 8+95, pls. 10*).—The results of extended experiments are

reported upon the preservative properties and toxic effects of benzoic acid and the effects of benzoic acid and sodium benzoate upon the heart, the red corpuscles, and blood pressure. The results of digestion experiments, including tests in vitro, with small animals and man, and of metabolism experiments with man are presented.

The conclusions which the author reached were in effect as follows:

Benzoic acid and sodium benzoate, even in quantities as low as 1 to 1,000, acted as a preservative with chopped meat, and also prevented mold formation on oleomargarine for 52 days.

Cold-blooded and warm-blooded animals (frogs and rabbits) were able to bear, even for a long period, considerable quantities of benzoic acid and sodium benzoate supplied in different ways. When 1 gm. sodium benzoate per kilogram of body weight was injected into rabbits for 12 days no loss in body weight was noted. Larger doses temporarily lowered body temperature. No effect was noted on respiration and pulse. When 2.2 gm. or more of sodium benzoate per kilogram of body weight was used the animals died. When 5 gm. benzoic acid, or 7 gm. sodium benzoate, was fed at a time with 500 cc. of milk to a dog of medium weight, respiration, pulse rate, and body temperature were not noticeably affected.

In an experiment of which the author himself was subject 10 gm. benzoic acid taken within 3½ hours produced no noticeable effect upon respiration, body temperature, digestion, or general condition.

When from 0.5 gm. to 1 gm. sodium benzoate per day was taken for 44 consecutive days no effects were noted and body weight remained normal in all the subjects. Respiration, pulse, and body temperature were not noticeably affected when 1 or 2 gm. benzoic acid or sodium benzoate was taken.

Benzoic acid and sodium benzoate affected the red blood corpuscles in the same general manner as acids and salt solutions, respectively.

Injections of 4 cc. of a 5 per cent solution of sodium benzoate had no effect upon the heart frequency of a frog, nor did the injection of 1 cc. of a 20 per cent solution given within an hour.

Sodium benzoate intravenously injected into a suspended frog heart had less effect than sodium chlorid solution of equal concentration. The same was found to be the case in experiments with surviving cat heart. In the case of rabbits the blood pressure was influenced only very slightly and temporarily.

As shown by the experiments reported, neither gastric juice, trypsin, nor diastatic ferments were affected by the addition of benzoic acid or sodium benzoate. In the case of a dog with a Pawlow fistula no effect upon the quantity supplied or the digestive power of the gastric juice was observed when 3 gm. benzoic acid, or 5 gm. sodium benzoate, was taken.

As shown by a test breakfast, withdrawn after an hour, the author himself being the subject, 0.5 gm. benzoic acid, or 1 gm. sodium benzoate, did not influence the amount of free hydrochloric acid, the total acidity, or digestive power.

No effect was noted upon the protein condition of the body or the digestibility of protein and fat in experiments with men, when 1 gm. benzoic acid, or 1.5 gm. sodium benzoate, per day was taken for 6 days.

Daily doses of 1 gm. benzoic acid taken for 82 out of 86 and 88 out of 92 days did not cause any noticeable effect upon general condition, body weight, etc. At the conclusion of the test it was found that benzoic acid taken either with a mixed diet or with a vegetable diet was fully converted into hippuric acid.

The literature of the subject is discussed at length and a bibliography is appended.

Calorimetric observations on man, J. S. MACDONALD (*Jour. Physiol., 44 (1912), No. 1–2, pp. IV, V*).—A brief account is given of a calorimeter modeled on the Atwater-Rosa-Benedict apparatus devised at Middletown, Conn., having the same general dimensions, and protected from surface loss or gain of heat in the same manner. The calorimeter is not equipped to deal with the respiratory exchange of gases and is therefore not a respiration calorimeter.

"Departures from the original model have been made, notably in an extension of the internal radiator system and the insertion of an additional internal source of heat. The latter arrangement is used as a compensating system whereby the total heat measurement is maintained as far as possible a constant. The heat output of the subject is found by subtracting from this the momentary values for the heat output of the compensating system.

"This change in method is due to experimental observation of a definite relation between the temperature of the calorimeter (T_c) and the mean temperature of the internal system (T_r) such that the heat measured by reference to the temperature and quantity of the water stream = $k (T_c - T_r)$.

"The value of "k" in this calorimeter was such as to render difficult all attempts to follow abrupt variations in the subject's heat output. Thus when a period of work interrupted a period of rest it became evident that $T_c - T_r$ must have a new value of perhaps 8° C., entailing a sudden change in the temperature of the water entering the radiator system of 10° C. Because of the slow rate, and the lack of precision, with which such alterations in temperature could be obtained the preceding method was adopted."

The data obtained every 5 minutes throughout an experiment are of three kinds: "(1) Heat stored in, or lost from, the calorimeter walls as inferred from observed variations in temperature; (2) heat removed by water traversing an internal radiator system; (3) heat stored in a change of state in water, and measured by reference to the excess aqueous vapor leaving the calorimeter in the air stream."

Experiments have been performed with a number of subjects under alternating conditions of work and rest and in two instances with a subject asleep.

According to the author, the most interesting features of the results obtained, briefly stated, are as follows:

"The performance of work entails an increased heat output which gradually rises toward a maximum reached at the end of about 1½ hours. This maximum is then maintained until the cessation of work.

"In order to discover the degree to which this initial portion of the heat output curve is rendered gradual by a storage of heat in the subject's body as evidenced by a coincident rise in body temperature, the latter has in the most recent of these experiments been measured . . . [by a thermocouple method]. We have not, so far, found sufficient variations in temperature to explain the whole effect, though their nature is always such as to explain some fraction of this. It would appear, then, that the 'efficiency' diminishes as the temperature of the body increases."

A new calorimeter for small warm-blooded animals, A. V. HILL (*Jour. Physiol., 44 (1912), No. 1–2, pp. I, II*).—A small calorimeter for warm-blooded animals is described, the essential details being: "(1) A large cylindrical Dewar flask of depth 40 cm. and diameter 10 cm.; (2) a coil of fine copper tubing inside the flask, through which water runs at a uniform rate to take away the heat formed; (3) a thermocouple with its ends in (a) the water going into the flask, and (b) the water coming out of the flask; (4) a galvanometer in another part of the laboratory registering the current through the thermocouple; (5) a Mariotte bottle supplying water at a uniform rate;

(6) a cage of perforated zinc which can be drawn in and out of the flask; (7) tubes for an air supply to the inside."

In operating this calorimeter the temperatures of the water are taken by means of the thermocouple just at its entrance and exit. The observed difference in temperature multiplied by the quantity of water flow per minute gives the heat in calories. The Dewar flask used as a calorimeter chamber is mounted in a box of sawdust, and the water used to take up the heat generated passes around a lead coil outside the flask before passing around the coil inside the flask. "Thus the outside is kept permanently at the temperature of the water which goes in, and it is then found that by this differential arrangement the heat loss is proportional to the actual galvanometer deflection; for 1° C. registered by the galvanometer there is a loss of some 2.9 calories per 1 minute."

Electrical check tests show a very close agreement between the calculated and observed heat production.

ANIMAL PRODUCTION.

General review of zoology, I. M. CAULLERY (*Rev. Gén. Sci., 23 (1912), Nos. 9, pp. 353–359; 10, pp. 395–402*).—This is a review of the literature published in 1910 and 1911 on heredity, variation, evolution, Mendelism, predetermination of sex, and related topics.

The mechanistic conception of life, J. LOEB (*Pop. Sci Mo., 80 (1912), No. 1, pp. 5–21*).—It is pointed out that the controversy between the vitalists and mechanists is of little importance as regards the progress of biology, but is of vital interest when the results of biological studies are applied to ethical and sociological problems. Recent work has shown that the activation of the egg by the spermatozoa is a chemico-physical process; that individual life begins with the acceleration of the oxidation in the egg, and is not determined by the entrance of a metaphysical life principle; and that the study of heredity is to-day the study of an exact science, and not merely the field of the metaphysician and rhetorician.

These results have been obtained by physico-chemical research, and are cited in support of the mechanistic conception of life, which the author states is the only one compatible with ethics because instincts are based on chemical mechanism.

The comparative physiology of response in animals, J VON UEXKÜLL (*Umwelt und Innenwelt der Tiere. Berlin, 1909, pp. 259; rev. in Science, n. ser., 31 (1910), No. 791, pp. 303–305; Nature [London], 83 (1910), No. 2116, pp. 331, 332*).—A summary of studies on the relation of the organism to its environment, which is of interest to the physiologist and psychologist. The topics discussed are the nature of protoplasm, the conversion and differentiation of fluids into organs, and the comparative physiology of refluxes in the lower animals.

The behavior of chicken sarcoma implanted in the developing embryo, J. B. MURPHY and P. ROUS (*Jour. Expt. Med., 15 (1912), No. 2, pp. 119–132, pls. 6*).—Among the conclusions reached are the following: "The direct inoculation of a sarcoma of the fowl into the developing chick embryo or its membranes has yielded growths in many cases. The best results have been obtained with grafts of the living tumor tissue, but, as in the adult, growths can be engendered with dried tissue or with the Berkefeld filtrate of a tumor extract. When living tumor tissue is used, an actual transplantation occurs . . . Relatively speaking, the embryo seems much more favorable than the adult as a host for the sarcoma."

The structure of reproductive organs of domesticated animals, R. SCHMALTZ (*Die Struktur der Geschlechtsorgane der Haussäugetiere. Berlin, 1911, pp. XII+388, figs. 168; abs. in Jour. Roy. Micros. Soc. [London], 1911, No. 6, p. 743*).—A monograph on the generative organs of the horse, ox, sheep, pig, dog, and cat.

The function of the accessory reproductive glands in male mammals, E. IWANOV (*Arch. Mikros. Anat., 77 (1911), No. 2, II, pp. 240–248; abs. in Jour. Roy. Micros. Soc. [London], 1912, No. 2, p. 167*).—The author concludes that the main function of the accessory male reproductive glands is to supply a diluting medium for the spermatozoa. The secretion of the prostate also contains elements which apparently contribute to fermentative processes, and which seem to increase the locomotor energy of the spermatozoa and to shorten their length of life.

The origin of sexual differences, P. KAMMERER (*Fortschr. Naturw. Forsch., 5 (1912), pp. 1–240*).—A systematic summary and critical discussion of the nature and causes of sex, effect of castration, and related topics.

A bibliography of about 700 references is appended.

Recent work on the determination of sex, L. DONCASTER (*Ann. Rpt. Smithsn. Inst. 1910, pp. 473–485*).—A reprint, with additions, of an article noted from another source (E. S. R., 22, p. 273).

Historical-critical studies on hair and hair colors in domesticated animals, with special reference to abnormal whitening, H. WIEGMANN (*Historisch-kritische Studien über Haar- und Hautfarben bei Haustieren mit besonderer Berücksichtigung des Albinismus und Leucismus. Inaug. Diss., Univ. Bern, 1910, pp. 48*).—A review of the literature on the causes of localization of pigment in horses, cattle, sheep, and swine.

Concerning an important kind of hair and the hair coat system of mammals, K. TOLDT, Jr. (*Ann. K. K. Naturhist. Hofmus. [Vienna], 24 (1910), No. 1–2, pp. 195–268, pls. 4, fig. 1*).—The morphology, physiology, and distribution of different kinds of hair in mammals are treated in detail. A bibliography is appended.

Comparative anatomy of supernumerary digits in certain ungulates as evidence of the interrelationship existing between the various species, J. SHARE-JONES (*Vet. Jour., 67 (1911), Nos. 429, pp. 145–157; 432, pp. 344–355, figs. 10*).—A comparative study of abnormal digits in the horse, ox, and pig. The principal structures noted in detail are the bones, tendons, and ligaments.

The continuous origin of certain unit characters as observed by a paleontologist, H. F. OSBORN (*Amer. Nat., 46 (1912), Nos. 544, pp. 185–206; 545, pp. 249–278, figs. 8*).—The author's studies of the skull and horns of Titanotheres, the horns of cattle, the cranium of man, and the skull and teeth of horses indicate that discontinuity in heredity affords no evidence whatever of discontinuity of origin, and that new characters arise by excessively fine gradations which appear to be continuous. If discontinuities or steps exist they are so minute in these characters as to be indistinguishable from those fluctuations around a mean which seem to accompany every stage in the evolution and ontogeny of unit characters.

"Because the grosser form of Lamarckian interpretation of transmission of acquired characters has apparently been disproved, we must not exclude the possibility of the discovery of finer, more subtle relations between the germ plasm and the soma, as well as the external environment."

The inconstancy of unit characters, W. E. CASTLE (*Amer. Nat., 46 (1912), No. 546, pp. 352–362*).—In opposition to the views of the genotype and pure line advocates, the author finds that by constant selection in one direction a character may be modified gradually, and cites examples of his own experience in

support of his argument. Thus, a silvered variety of guinea pig was produced by systematic selection from a tri-colored race. The silvered area was gradually increased from an individual which had white hairs interspersed with red on the lower side of the body. In experiments with hooded rats, involving 12 generations and over 10,000 individuals, the pigmented areas were increased in one series and decreased in another by systematic selection. The view is held that the causes of variability are not necessarily located in the chromosome of the cell.

Mendelian proportions and the increase of recessives, F. RAMALEY (*Amer. Nat., 46 (1912), No. 546, pp. 344–351*).—This is a study of stable ratios involving Mendelian dominants, heterozygotes, and recessives as exemplified in the inheritance of left-handedness. The author states that the same results will apply to any recessive character when not selected against in mating. Recessive characters tend to increase in numbers at the expense of original dominant types if not inherently weak in some respect.

"These conclusions are reached from a consideration of the following points: (1) The greater ease with which characters may be lost than gained; (2) the great number of combined dominants and heterozygotes which through mutation may reach a simpler condition as compared with the small number of recessives and heterozygotes which may be imagined as affording opportunity for mutation to dominance; (3) the more likely survival of recessives in an environment of changing conditions in which now the dominant and now the recessive is hard pressed to maintain its existence."

Mendel's laws and stock breeding, J. WILSON (*Hoard's Dairyman, 42 (1911), No. 47, p. 1442*).—An explanation of the principles of Mendelian inheritance so that it can be understood by the stock breeder.

Mendelism and sex inheritance, E. RAIL (*Hoard's Dairyman, 43 (1912), No. 13, p. 502*).—A criticism of the article noted above, in which it is maintained that it has not yet been proved that sex is a Mendelian character, and if so would be operative all the time.

Mendel's law and the occurrence of sex (*Farm Poultry, 23 (1912), No. 5, pp. 151, 152*).—A discussion of Whitman's work regulating sex in pigeons, as reported by Riddle and of an article by Peck previously noted (E. S. R., 26, p. 773). Concerning the latter the author says: "It fails to account for the male that produces principally females, however mated; and the female that produces principally males. The most conspicuous cases of excess of one sex that I have known or heard of in poultry were cases of males that produced a large excess of females, however mated."

Are horns in sheep a sex-limited character? W. E. CASTLE (*Science, n. ser., 35 (1912), No. 902, pp. 574, 575*).—A criticism of the conclusions in the article of Arkell and Davenport, noted previously (E. S. R., 26, p. 769). The author considers that the assumption of an inhibiting factor is superfluous, as Bateson's hypothesis that the horn character is dominant in males and recessive in females is adequate to explain the results obtained.

A critical examination of recent studies on color inheritance in horses, A. H. STURTEVANT (*Jour. Genetics, 2 (1912), No. 1, pp. 41–51*).—A résumé of papers dealing with English Thoroughbreds, Shires, Scotch Clydesdales, French Percherons, and the American Harness horse. The work is summarized as follows:

"It seems probable that chestnut always breeds true. Therefore the placing of chestnut or yellow at the bottom of the scale probably represents the condition of nearly all breeds of horses. Epistatic to it is black. Next comes, in the breeds studied, bay or brown, epistatic to both the preceding. Gray is next higher. Next is roan, which is probably always evident when present (unless

suppressed by the next factor, white), and which probably merely causes a sprinkling of white hairs, without otherwise affecting the color. Finally, we have white."

Hybridization studies.—V, Spermatogenesis in hybrids, H. Poll (*Arch. Mikros. Anat., 77 (1911), No. 2, II, pp. 210–239, pl. 1, figs. 3; abs. in Jour. Roy. Micros. Soc. [London], 1912, No. 2, p. 167*).—The author studied the reproductive organs of hybrid ducks (*Cairina moschata* and *Anas boschas*) and of a year-old mule. The tissues of the hybrids were found similar to those of the pure type, except in the development of the reproductive cells.

A bibliography is appended.

The domesticated animals of ancient Egypt, P. Kuschiel (*Die Haustiere Agyptens in Altertum. Inaug. Diss., Univ. Leipsic, 1911, pp. 45*).—A study of data furnished by inscriptions on monuments and other historical sources concerning the animal husbandry of the ancient Egyptians.

A bibliography is appended.

The extinct fauna of Crete and its relation to the Minotaur legend, C. Keller (*Vrtljschr. Naturf. Gesell. Zürich, 54 (1909), No. 3–4, pp. 424–435, fig. 1*).—From a study of fossils found on the island, the author concludes that *Sus scrofa*, *Cervus elaphus*, *Capra œgagrus*, *Bison europœus*, and *Bos primigenius* existed there as wild animals in the time of Minos. Bones of tame swine were found, but are supposed to belong to *Sus indicus*. The palace at Knossos contains works of art, in which *Bos primigenius* is depicted as domesticated and used in bull fighting in premycenæan times. It is suggested that this gave rise to the Minotaur myths.

Report of the Live Stock Commission, New Jersey, E. T. Gill et al. (*Rpt. Live Stock Com. N. J., 1910–11, pp. 58, pls. 12*).—A summary of the activities of the live stock commission in directing and encouraging breeders in their efforts toward improving the various breeds of live stock found within the State. There is a list of breeders of pure-bred live stock in the State, and a directory of certified stallions now in service.

Fodders and feeding stuffs, F. T. Shutt (*Canada Expt. Farms Rpts. 1911, pp. 181–183*).—An analysis of burnet (*Poterium canadense*) is given as follows: Water 80.24, protein 3.87, fat 0.24, carbohydrates 4.11, fiber 9.75, and ash 1.79 per cent. Analyses are also reported of cotton-seed and linseed meals.

[Analyses of feeding stuffs], R. E. Rose and E. P. Greene (*Fla. Quart. Bul. Agr. Dept., 22 (1912), No. 2, pp. 186–192*).—Analyses are reported of cotton-seed meal, dried beet pulp, wheat middlings, molasses feed, and proprietary mixed feeds.

Feeding stuffs, J. A. Voelcker (*Jour. Roy. Agr. Soc. England, 72 (1911), pp. 365–370*).—Analyses are reported of cotton-seed cake, coconut cake, bran, sugar beets, acorns, and a mixture of molasses and wood fiber sold under the name of "bastol."

[Feeding experiments in 1910], J. H. Grisdale, R. Robinson, J. Murray, and G. H. Hutton (*Canada Expt. Farms Rpts. 1911, pp. 71–76, 76–80, 341, 342, 380–387, 507–509*).—This continues work previously noted (E. S. R., 24, p. 471).

Tests in feeding Angus and Shorthorn steers various proportions of bran, gluten meal, oil-cake meal, clover hay, corn silage, turnips, mangels, and oat straw are reported. Five lots of 20 steers made average daily gains for 290 days ranging from 1.47 to 1.74 lbs., at costs ranging from 4.8 to 8.3 cts. per pound. Subsequently 4 lots of 18 steers made average daily gains for periods of from 62 to 70 days ranging from 1.09 to 2.2 lbs., at costs ranging from 6.66 to 9.44 cts. per pound.

In other tests 64 steers made a gain of 1.64 lbs. per head and day for 165 days at a cost of 9.74 cts. per pound, and 20 steers a daily gain of 1.48 lbs. for 157 days at a cost of 11.25 cts. per pound.

An experiment in sheltering cattle gave the following results for 155 days: With outside feeding the average daily gain per head was 1 lb., at a cost of 18.53 cts. per pound, and the loss per steer was $1.84. Steers fed inside gained on an average 1.56 lbs. per head and day, at a cost of 7.73 cts. per pound, and returned a surplus over the cost of feeding of $13.77. It is stated that the small gains made were due to the method of feeding. Oat straw was used for roughage and was not liked by any of the animals.

In a comparison of corn silage and roots for fattening lambs, 3 lots of 9 lambs each were fed 124 days. Lot 1, receiving turnips ad libitum, made average daily gains per head of 0.24 lb. at a cost of 8.8 cts. per pound. The corresponding gains for lot 2, receiving silage ad libitum, and lot 3, receiving both turnips and silage ad libitum, was 0.29 and 0.27 lb., and the cost 7.03 and 7.76 cts. per pound. It is concluded that silage is superior to turnips for fattening lambs, and that it can be profitably used as a part of the roughage ration.

A test of different rations for pigs gave the following gains per head and day for 86 days: Chopped barley 0.9 lb., at a cost of 3.19 cts. per pound; barley and tankage 1.04 lbs., at a cost of 3.72 cts.; peas, oats, and barley 0.85 lb., at a cost of 3.32 cts. per pound; mixed grain and tankage 0.86 lb., at a cost of 4.1 cts. per pound; and mixed chop and tankage 1.23 lbs., at a cost of 4.4 cts. per pound.

Fattening beef calves in Alabama, D. T. Gray and W. F. Ward (*Alabama Col. Sta. Bul. 158, pp. 175–224e, figs. 17*).—The first experiment reported was to determine the cost of finishing 77 high-grade calves for market on different feeds. Three lots from 6 to 8 months old were kept for 4 months on a basal ration of cotton-seed hulls and alfalfa hay. Lot 1, on a supplementary ration of cotton-seed meal, made an average daily gain of 1.71 lbs. at a cost of 6.22 cts. per pound; lot 2, with cotton-seed meal and corn-cob meal in the proportion of 2:1, made an average daily gain of 1.76 lbs., at a cost of 6.19 cts. per pound; lot 3, with cotton-seed meal and corn-cob meal in the proportion of 1:2, made a gain of 1.83 lbs., at a cost of 6.83 cts. per pound. The third lot gave a larger percentage of dressed weight and sold for better price, but not enough more to pay for the extra cost of feed.

To determine if calves can be fattened profitably for the spring market on a feed of cotton-seed meal, cotton-seed hulls, and mixed peavine hay, 52 calves were divided into 2 lots, one lot receiving the shelter of a good barn, and the other fed in the open; but as it was found that the young calves would not thrive during the winter months without shelter the entire lot was placed in sheds. During a period of 112 days the average daily gain for the entire lot was 1.24 lbs., at a cost of 6.97 cts. per pound. Each calf netted a profit of $3.50.

A test was made in wintering calves and fattening them the following summer on pasture. Thirty-four calves were wintered on cotton-seed meal and hulls, corn chop, and alfalfa hay. The average daily gain for 112 days was 1.13 lbs., at a cost of 8.63 cts. per pound. On March 25 they were turned on good pasture, and in 89 days made an average daily gain per head of 1.33 lbs., at a cost of 4.84 cts. per pound. The profit for each calf was $1.86.

Among the conclusions drawn are the following: "A farmer may expect to obtain a reasonable profit on beef calves when he raises and fattens them on his farm and sells them when they are 12 to 14 months old. . . . In the South, at least in Alabama at the present time, the calves should be born dur-

ing the early spring months. . . . Young calves can be finished for the market at a profit on cotton-seed meal, cotton-seed hulls, and peavine hay, but it is more profitable to introduce corn-and-cob meal to take the place of part of the cotton-seed meal. . . . The tests seem to indicate that it is more profitable to feed a heavy ration and sell the calves at the end of the winter months, when the prices are normally high, than to hold them until the early summer months."

Shorthorn herds in Ireland, 1911 (*Dept. Agr. and Tech. Instr. Ireland Jour., 12 (1912), No. 2, pp. 232–274, pls. 30*).—A brief account of the pure-bred Shorthorn herds in Ireland.

Sinus hairs of the ox, D. TRETJAKOFF (*Ztschr. Wiss. Zool., 97 (1911), No. 2, pp. 314–416, pls. 4; abs. in Jour. Roy. Micros. Soc.* [*London*], *1912, No. 1, p. 31*).—The author describes the nerve endings in connection with the sinus hairs about the snout, lips, and other parts of the ox. It is thought that the sinus hairs play an important part in the recognition of different kinds of plants.

Wool, A. F. BARKER (*Jour. Roy. Agr. Soc. England, 72 (1911), pp. 62–85, figs. 11*).—This discusses the quality of wool fiber, yarns, and woolen fabrics, influence of breed and environment on variation in wool fiber, relative values of heavy and light fleeced sheep, and allied topics.

Pig-feeding experiments, J. M. SCOTT (*Florida Sta. Rpt. 1911, pp. XVI–XIX*).—In a feeding test involving 5 lots of 5 pigs each, and lasting 60 days, the total gains for each lot were as follows: On velvet beans in the pod, 25 lbs.; velvet beans in the pod and Japanese cane 1:1, 4.3 lbs.; velvet beans in the pod and Japanese cane 2:1, —7.7 lbs.; Japanese cane alone, 61 lbs.; and velvet beans in the pod and sweet potatoes 1:1, 12.3 lbs.

In a feeding test which lasted 90 days and with 5 pigs in each lot. those given shelled corn made an average gain per head and day of 0.26 lb., at a cost of 8.19 cts. per pound; shelled corn and culled velvet beans 1:1 by weight 0.17 lb., at a cost of 9.96 cts. per pound; shelled corn, culled velvet beans, and shorts 1:1:1, 0.26 lb., at a cost of 8.98 cts. per pound; and shelled corn and culled velvet beans 1:1, and all the green sorghum they would eat, 0.24 lb., at a cost of 7.96 cts. per pound.

Seventeen pigs 3 months of age, when put on a ration of corn, shorts, milk, and green sorghum, made in 30 days an average daily gain per head of 0.96 lb.

The pig industry, R. T. ARCHER (*Jour. Dept. Agr. Victoria, 10 (1912), Nos. 2, pp. 73–82; 3, pp. 160–169; 4, pp. 239–255, figs. 27*).—This contains information on breeds of pigs, cooperative bacon factories, the international trade in pork products, and statistical data on the pig industry.

Studies on conformation, function, and pilosity in horses, W. KRYNITZ, H. MAGERL, and A. RAST (*Arb. Deut. Gesell. Züchtungsk., 1911, No. 11, pp. 208, figs. 4*).—This contains 3 articles. The first two, by Krynitz and Magerl, discuss the correlation between form and function of the different types of horses. A large number of measurements are submitted, and both authors think that the adaptability of the horse to slow or fast work can be predicted with a reasonable degree of accuracy by making measurements. The third article, by Rast, is a study of the characters of the hair and hair whorls as an aid in judging horses.

Bibliographies are appended.

Feed, care, and management of breeding stallions, brood mares, work horses and young foals, F. C. MINKLER (*Live Stock Com. N. J. Circ. 2, 1912, pp. 30, pls. 3*).—This contains general information of interest to horse breeders, a list of stallions now in service, and a copy of the state stallion law.

The horse-breeding industry in Yorkshire, H. E. FAWCUS (*Jour. Roy. Agr. Soc. England, 72 (1911), pp. 85–116*).—A historical account of the types of horses which have been bred in Yorkshire, including a general discussion of the condition of the horse-breeding industry.

Report of the poultry manager, A. G. GILBERT (*Canada Expt. Farms Rpts. 1911, pp. 277–294, pl. 1*).—This contains statistics on prices and production of poultry, discusses the grading of poultry and eggs and the sale of poultry products through cooperative societies, and reports experimental work at the station.

As regards fertility of eggs there seemed to be no advantage in limiting the males to a small number of hens. The percentage of eggs hatched by hens was larger than that hatched by incubator. On a free range the chickens gained 1.15 lbs. each in 2 months, while on a limited run the gain was 2.45 lbs. Experiments by F. T. Shutt in the preservation of eggs indicated that lime-water is superior to water glass as a preservative.

Housing farm poultry, A. G. PHILIPS (*Indiana Sta. Circ. 37, pp. 16, figs. 21*).—A trap nest, oat sprouter, and several poultry houses are illustrated and described.

Egg records for the year 1910–11 (*Dept. Agr. and Tech. Instr. Ireland Jour., 12 (1912), No. 2, pp. 374–387*).—This contains egg records of 153 flocks of fowl.

The important subject of eggs, G. B. MORSE (*Rel. Poultry Jour., 19 (1912), Nos. 3, pp. 493, 494, 525–528; 4, pp. 656, 657, 685–688*).—This article reviews investigations on the bacteriology of the hen's egg. Summing up the work, the author states that fresh eggs laid by healthy virgin pullets are generally free from bacteria, whereas hens that have been mated or that have diseased ovaries lay eggs which are liable to be infected. The source of external infection and the transmission of disease to man and other fowls from infected eggs are discussed. Different methods of preserving eggs are described.

Preservation of eggs by freezing, F. LESCARDÉ (*Ber. II. Internat. Kältekong. Wien, 2 (1910), pp. 373, 374*).—This is a report of a successful attempt to preserve eggs for 13 months by subjecting them to low temperatures.

Raising Belgian hares and other rabbits, D. E. LANTZ (*U. S. Dept. Agr., Farmers' Bul. 496, pp. 16, figs. 5*).—This contains instructions both for those who wish to raise rabbits or hares chiefly for home consumption, and for those who desire to raise them for market. It discusses the history and characteristics of Belgian hares, selection of stock, hutches and pens, food and feeding, breeding, marketing, and ailments of rabbits.

Pond culture problems (*Wiener Landw. Ztg., 62 (1912), No. 11, pp. 123–125, fig. 1*).—The cleaning, liming, and general management of fish ponds are discussed, and a number of books and articles on the subject are reviewed.

DAIRY FARMING—DAIRYING.

The feeding problem, J. B. LASSEN (*Tidsskr. Landökonomi, 1912, No. 5, pp. 321–348*).—An address discussing the various methods of determining the feed requirements of dairy cows, and the application of the feed unit system in the bookkeeping on Danish dairy farms.

Experiment with sugar-beet slices (schnitzel) as a food for milch cows, D. TURNER and C. D. STEWART (*Agr. Students' Gaz., n. ser., 15 (1912), No. 6, pp. 185–188*).—In experiments with 6 cows, where the basal ration consisted of straw chaff, hay, Bombay cotton-seed cake, soy cake, gram, and molascuit, mangolds proved to be a better feed than sugar-beet chips. The butter from the lot fed on sugar-beet chips was hard, more difficult to work, and had to

be churned at a higher temperature, but the color of the butter was much better than that from the lot fed mangolds. The beet chips seemed to have a laxative effect at first, and the cows in that lot showed greater signs of thirst than those on the mangolds. Some little time was also necessary for the cows to become accustomed to the beet-chip ration.

Dairy cattle, J. H. GRISDALE (*Canada Expt. Farms Rpts. 1911, pp. 59–71*).—This describes the methods of feeding the station herd, methods of making cream cheese and Coulommier cheese, and contains the records of individual cows.

Winter dairying and creameries (*Dept. Agr. and Tech. Instr. Ireland Jour., 12 (1912), No. 2, pp. 281–303*).—This contains data on milk and butter production in Ireland.

Dairying in Denmark, 1911, B. BÓGGILD (*Tidsskr. Landökonomi, 1912, No. 4, pp. 257–276*).—This is the customary report on the conditions of Danish dairying during the year, with statistics relating to the dairying industry.

Report of the Austrian dairy committee on the condition of the dairy industry in the different crown lands, REINISCH ET AL. (*Österr. Molk. Ztg., 18 (1911), Nos. 11, p. 163; 13, pp. 195, 196; 18, pp. 275, 276; 23, pp. 356, 357; 24, pp. 371, 372; 19 (1912), Nos. 1, pp. 3–5; 3, pp. 37, 38; 4, pp. 50–52; 5, p. 66; 7, pp. 99, 100; 8, pp. 115–117; 9, pp. 132, 133; 10, pp. 147, 148; 11, pp. 163–165*).—This contains statistical data reported by different authors on the methods of management, milk production, and related topics in Vorarlberg, Kärnten, Salzburg, Steiermark, Lower Austria, Upper Austria, Moravia, Galicia, Silesia, Carniola, and Bohemia.

Cow mortality tables (*Hoard's Dairyman, 43 (1912), No. 18, pp. 689, 690*).—An attempt to estimate the average length of life of a dairy cow, based on data contained in the Holstein-Friesian herd books.

The inheritance of milk yield in cattle, J. WILSON (*Sci. Proc. Roy. Dublin Soc., n. ser., 13 (1911), No. 7, pp. 89–113*).—Records of Danish cows are submitted as a proof that improvement in milk yield by breeding is not a gradual process, as has been supposed, but is inherited in Mendelian fashion, that is, if a daughter is not on an approximate equality with her dam as a milk producer she is either much higher or much lower. The extreme grades are the parent strains, and the intermediate are the hybrids. Records of progeny of a few bulls are also given to bear out the same argument.

The "escutcheon:" A guide to milking merit, J. S. MCFADZEAN (*Jour. Dept. Agr. Victoria, 9 (1911), No. 9, pp. 585–599, figs. 23*).—This is an attempt to revive an old theory as advocated by Guenon. The different types of escutcheon are illustrated and described.

Testing the dairy cow, T. R. MIDDAUGH (*Ohio Sta. Circ. 122, pp. 121–134, figs. 13*).—This contains advice in regard to keeping records of dairy cows, and gives directions for the use of the Babcock test with milk and skim milk.

Secretion in the mammary gland, H. HOVEN (*Anat. Anz., 39 (1911), No. 11–12, pp. 321–326, figs. 4; abs. in Jour. Roy. Micros. Soc. [London], 1912, No. 2, p. 171*).—At the beginning of secretion in guinea pigs the cytoplasm of the cells contains numerous chrondriosomes, forming long undulating filaments. These break into granules, some of which are transformed into secretory granules (probably becoming casein or sugar), while others are transformed into minute drops of fat.

Milk, G. B. TAYLOR (*Bien. Rpt. La. Bd. Health, 1910–11, pp. 82–107*).—Analyses and bacterial counts of milk, and other results of milk inspection, are reported.

A biometrical study of milk streptococci, J. BROADHURST (*Jour. Infect. Diseases, 10 (1912), No. 3, pp. 272–284, figs. 4*).—A study of the fermentative

reactions of different species of streptococci found in milk. The results are summarized as follows:

"Morphological characters are not correlated with fermentative powers. Milk and neutral red are not sufficiently diagnostic to aid in determining the sources of streptococci. Lactose, saccharose, salicin, raffinose, mannit, and inulin seem to have significant fermentative reactions. Saccharose, salicin, and inulin should be tested with human, bovine, and equine streptococci. The milk streptococci form a large number of groups when classified with regard to their effect upon the six test substances. The milk streptococci are characterized by unusually high fermentative powers. The incomplete data at hand indicate that the milk strains are most like the human strains; there is less likeness between the milk and the bovine strains; they show practically no resemblance to the equine strains.

"It is proposed to continue this quantitative comparison of fecal (human, bovine, and equine) and milk streptococci in these and other media, in the hope that complete quantitative comparisons will give a method of determining the source of streptococcal pollution of milk."

Silicates in milk from glass bottles, H. SCHULZ (*München. Med. Wchnschr., 59 (1912), No. 7, pp. 353, 354; abs. in Clean Milk Bul., 1 (1912), No. 5, p. 107*).—These experiments consisted of boiling modified milk in bottles of various kinds from 5 to 15 minutes. There was an increase of silicic acid in milk which had been sterilized in cheap bottles, while milk boiled in bottles made of better glass contained only a trifling amount. Momentary boiling in cheap bottles showed no acid.

Investigations on dairy bacteriology, WEIGMANN and A. WOLFF (*Milchw. Zentbl., 41 (1912), Nos. 1, pp. 2–6; 3, pp. 65–68; 4, pp. 97–100; 5, pp. 129–134*).—A report of experiments in isolating several organisms which were found to cause a bitter taste, premature coagulation, and other abnormal qualities in milk.

A milk-borne epidemic of typhoid fever, E. B. BIGELOW (*Jour. Amer. Med. Assoc., 57 (1911), No. 18, pp. 1418–1420*).—A brief report in which the sources of outbreaks of several cases of typhoid epidemics were located by testing for the Widal reaction samples of blood from every person connected with the suspected dairies. It is maintained that the disease could be nearly eliminated if typhoid carriers were sorted out by testing specimens of blood from all persons living on dairy farms or handling food consumed without heating, and prohibiting those reacting from engaging in such occupations.

Sanitary improvement of milk supply, E. C. LEVY and T. J. STRAUCH (*Ann. Rpt. Health Dept. Richmond, Va., 1911, pp. 45–59, 140–143, figs. 2*).—This contains a report of the work relating to milk inspection, which shows a great improvement in the quality of milk and sanitary surroundings of dairies since the inspection was begun in 1907.

[Refrigeration in the dairy industry] (*Ber. II. Internat. Kältekong. Wien, 2 (1910), pp. 353–367, 400–430, figs. 7*).—These papers were read at the second International Refrigeration Congress, held at Vienna, October, 1910.

The effect of cold storage upon the bacteriological and chemical changes in milk and butter, C. E. Marshall (pp. 353–367).—This is a semipopular review of investigations at the state experiment stations in the United States and by the Dairy Division of this Department. The work is summarized as follows: "Milk and butter must be frozen to check completely the growth of microorganisms. Enzymic action probably is not completely inhibited by low temperatures and freezing, or, in other words, there may be deterioration in milk and butter even when frozen. The effect of lower temperatures than these cited herein is not determined."

The application of low temperatures to the curing and storage of Cheddar cheese, S. M. Babcock (pp. 400–414).—This is a historical résumé of investigations of refrigeration which have been of practical value in manufacturing Cheddar cheese.

Employment of refrigeration in the cheese industry, P. Guerault (pp. 415–422).—A résumé of some European methods.

The application of refrigeration in the manufacture of Roquefort cheese in Aveyron, P. Lebrou (pp. 423–430).—The details of making Roquefort cheese are described, with special reference to the influence of temperature as affecting the quality of the cheese.

Cost of making [butter], F. Ballantyne et al. (*N. Y. Produce Rev. and Amer. Cream., 34 (1912), No. 3, pp. 90–92*).—These are estimates of practical butter makers on the cost of making butter. The figures submitted range from 1.42 to 3 cts. per pound.

Cost of making [cheese], F. Ballantyne et al. (*N. Y. Produce Rev. and Amer. Cream., 34 (1912), No. 3, pp. 110, 111*).—This consists of statements of practical cheese makers, showing that the cost varied from 55 cts. to $2.50 per 100 lbs. The two principal factors which influence the cost of making are the time of year and the amount of cheese made.

The manufacture of "gray" cheese in the Tyrol, J. Hussmann (*Milchw. Zentbl., 41 (1912), Nos. 2, pp. 55–58; 3, pp. 86–90*).—A discussion of the management of dairy farms in the Tyrol, and the methods of making a skim milk cheese known in that region as "gray" cheese.

How to make "Jack" cheese, E. H. Hagemann (*Pacific Dairy Rev., 16 (1912), No. 12, pp. 3, 4; N. Y. Produce and Amer. Cream., 34 (1912), No. 2, pp. 66, 67*).—Details of making "Jack," formerly called Monterey, cheese are given.

A coating for cheese, A. Frestadius (*Nord. Mejeri Tidn., 27 (1912), No. 14, p. 159; abs. in N. Y. Produce Rev. and Amer. Cream., 34 (1912), No. 2, pp. 54, 55*).—This is a recipe for making a new preparation for coating half-soft cheeses of the Stilton and Gorgonzola type, and which consists of vaseline, plaster of Paris, gum arabic, and salt. The vaseline is used to give it the consistency of butter, the gum arabic to make the paste pliable and adhesive, and the salt to keep it moist and soft. Vaseline and plaster of Paris, when used without the salt and gum arabic, dried up and fell to powder.

Concerning buttermilk and its derivatives, F. Leperre (*Handel. Vlaamsch Natuur en Geneesk. Cong., 15 (1911), pp. 49–52*).—Analyses of buttermilk and whey are reported.

VETERINARY MEDICINE.

Springtime surgery, edited by D. M. Campbell (*Chicago, 1912, pp. 143*).—This is a collection of articles which have appeared from time to time in the *American Journal of Veterinary Medicine*, and which deal chiefly with those surgical procedures which are employed in the spring of the year.

Biological products, C. H. Higgins (*Amer. Vet. Rev., 41 (1912), No. 3, pp. 282–289*).—This is a general discussion of the evolution of biological therapy. The methods of combating disease in Canada by means of serums, vaccines, etc., are described.

Report from the government veterinary surgeon for the year 1910–11, J. A. Raleigh (*Rpt. Dept. Sci. and Agr. Brit. Guiana, 1910–11, pp. 69–71*).—A brief account of the work of the year.

Report of the department of animal hygiene of the Emperor William Institute for Agriculture at Bromberg, Miessner (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 3 (1911), No. 1, pp. 30–41*).—This is a report of the activities of this division from 1906 to 1909, inclusive. It deals with the

results obtained with sero-diagnoses of glanders, combating tuberculosis, aggressin tests, preparation of vaccine against hemoglobinuria in bovines, toxicity of castor-oil seeds, septicemia pluriformis ovium, combating hemoglobinuria in bovines, beschälseuche, feeding tests (with eosin, beans, and sea fish), anaphylaxis investigations, paratyphoid investigations, chemotherapeutic tests with hemoglobinuria of bovines, and examination of the samples sent to the station.

Animal diseases in Formosa, J. D. REARDON (*Philippine Agr. Rev. [English Ed.], 5 (1912), No. 3, pp. 144–146*).—It is stated that while the Prefecture of Ako, which is about 42 square miles in area, has always been more or less infested with rinderpest, on July 10, 1911, the disease broke out in a very virulent form, 2,100 cases having been diagnosed since that date.

Investigations in regard to the receptivity of fowls for anthrax, and the reason for their resistance against this disease, W. MÖLLHOFF (*Untersuchungen über die Empfänglichkeit des Geflügels für Milzbrand und über die Gründe der Resistenz des Huhnes gegen diese Krankheit. Inaug. Diss., Univ. Bern, 1910, pp. 47; abs. in Centbl. Bakt. [etc.], 1. Abt., Ref., 49 (1911), No. 6, p. 162*).—The resistance of the fowl against anthrax is considered due to the presence of bactericidal substances in the lymph or other body fluids of this animal. When anthrax bacilli are placed into the subcuticular tissue they die in a very short time, and in this way prevent a local development of the anthrax organism and protect against a generalized infection. The origin of the bactericidal substances in the lymph could not be determined. Phagocytosis seems to have no significance for this disease in fowls. The resistance of the fowl to the disease is not due to its high body temperature.

The thermoprecipitation method for diagnosing anthrax, A. CASALOTTI (*Berlin. Tierärztl. Wchnschr., 27 (1911), No. 49, pp. 889, 890*).—The thermoprecipitation test is considered a good one for diagnosing anthrax.

The Ascoli precipitin reaction for diagnosing anthrax, L. GRANUCCI (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 10 (1911), No. 6, pp. 454–470; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 5 (1912), No. 1, pp. 867, 868*).—The specific precipitinogen was found to develop first at the site (or path) where the virus was injected, and the amount increases as the disease progresses. It is also dependent on the number of virulent organisms present, and the affinity which the organisms have for the virus. If the bacilli are present only sparingly the precipitinogen must be looked for at the area of the body which was first attacked by the organisms. The precipitinogen will withstand a temperature of 100° C. for several minutes. It is not destroyed by putrefaction nor by allowing it to dry for a year, and not in an organ which has been preserved in alcohol for 11 years or longer. Formalin changes or destroys the precipitinogen.

The specificity of Ascoli's precipitin reaction when utilizing various organs for the diagnosis, G. RONCAGLIO (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 9 (1911), No. 6, pp. 424–432; Clin. Vet. [Milan], Rass. Pol. Sanit. e Ig., 34 (1911), No. 10, pp. 450–458; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 4 (1911), No. 8, pp. 405, 406*).—The Ascoli reaction (E. S. R., 26, p. 375) was found positive only when anthrax was present. It made very little difference whether the organs used were in a state of decomposition or fresh. The most characteristic reaction was obtained with extracts from the spleen, but the other organs, etc., also gave good results. They behaved as regards specificity in the following order: The gelatinous mass (edema) in the skin (which surrounds the injection areas of guinea pigs treated with anthrax bacilli), the heart, lungs, blood, muscle, liver, kidneys, and brain substance.

Recent investigations on the etiology of foot-and-mouth disease. J. SIEGEL (*Vet. Jour., 68 (1912), Nos. 440, pp. 77–82; 441, pp. 155–159*).—This is a trans-

lation of a paper presented before an assembly of Prussian government veterinarians in November, 1911, relative to investigations of the causative organism of foot-and-mouth disease (*Cytorrhyctes aphtharum*). See also previous notes (E. S. R., 26, pp. 376, 682).

Foot-and-mouth disease in the Netherlands in 1911, H. Remmelts (*Dept. Landb., Nijv. en Handel, Verslag. en Meded. Dir. Landb. [Netherlands], 1912, No. 1, pp. 178, pls. 11, figs. 5*).—This is a detailed report on foot-and-mouth disease, of which 70,518 cases were reported during the year 1911.

The catalase contained in the milk of cows suffering from foot-and-mouth disease, H. Bertin-sans and E. Gaujoux (*Hyg. Viande et Lait, 6 (1912), No. 4, pp. 193–197*).—The catalytic activity of milk obtained from animals affected with foot-and-mouth disease is increased during the first stages of the disease, but as the disease progresses catalysis becomes less and finally it turns to the normal level.

Foot-and-mouth disease in horses, D. A. de Jong (*Tijdschr. Veeartsenijk., 38 (1911), No. 18, pp. 689, 690; abs. in Vet. Rec., 24 (1912), No. 1232, p. 514*).—While it is known that horses are somewhat susceptible to foot-and-mouth disease, cases of its transmission to them are very rare. In this paper the author records an instance of its occurrence in 3 foals, which had been weaned a few days previous to July 15, on which date they were placed in a field occupied by cattle suffering from the disease. Five days after the foals were placed in the field the first symptoms of the disease, namely, difficult prehension of food and salivation, appeared. The buccal mucous membrane showed aphthæ—some intact and others burst—at different points.

On June 30 one of the foals still showed salivation, and traces of vesicles were still clearly apparent upon the tongue and in other portions of the mucous membrane, but lesions upon other parts of the body, notably upon the feet, did not exist. These cases are thought to prove that it is insufficient in dealing with foot-and-mouth disease to confine preventive measures to ruminants and pigs.

Hoffmann's method against foot-and-mouth disease, Lucas (*Deut. Tierärztl. Wchnschr., 20 (1912), No. 11, pp. 162–165*).—Euguform, which is a chemical compound prepared from formaldehyde and guaiacol, was found to be a very efficient product for treating foot-and-mouth disease externally.

Immunizing horses against glanders with killed glanders bacilli (farase), A. Dediulin (*Ztschr. Infectionskrank. u. Hyg. Haustiere, 9 (1911), No. 6, pp. 382–391; abs. in Berlin. Tierärztl. Wchnschr., 28 (1912), No. 11, pp. 195, 196*).—On an estate, which during harvest time works 10,000 horses, 276 succumbed to glanders. In order to determine if horses could be immunized against the disease 303 out of a group of 600 animals were treated with "farase" (E. S. R., 19, p. 887). One year and four months after the inoculation 14 of the non-immunized animals became glanderous. No cases of glanders were noted among the vaccinated horses with the mallein test, although they had been in direct contact with the unvaccinated animals throughout the entire period.

In regard to the cause and the diagnosis of Malta fever, K. Saisawa (*Ztschr. Hyg. u. Infektionskrank., 70 (1912), No. 2, pp. 177–203; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 5 (1912), No. 3, pp. 12, 13*).—The following conclusions were drawn:

(1) The causative agent of Malta fever is a bacterium which appears in the form of a short rod. The name *Bacterium melitense* is therefore to be given in preference to *Micrococcus melitensis*. (2) The bacteria grow in dextrose solutions, but best on alkaline media. (3) The bacteria possess a certain pathogenicity for rabbits and guinea pigs, the disease running the course of an acute sepsis. (4) In healthy animal and human sera, as well as sera which origi-

nate from cases of other diseases—that is, by normal agglutinins—the Malta fever bacteria are agglutinated, although their behavior toward normal agglutination depends largely upon the strain employed and the individual composition of the sera having variant agglutinability. (5) With rabbit and goat immune sera and in the sera obtained from Malta fever subjects the agglutinability of the various strains tested was very uniform. (6) The agglutinins of normal serum were inactivated by heating serum for one-half hour at 55° C., while the immune-agglutinins remained stable at this temperature. It is therefore recommended that for diagnostic purposes the serum obtained from an affected subject be heated for one-half hour at 55° C. before conducting the test. (7) With watery extracts of Malta fever bacteria a specific complement-fixing substance can be demonstrated in the serum with the aid of the complement-fixation test. (8) The opsonic index for Malta fever bacteria in the serum was in one of the cases increased.

Contribution to the diagnosis of Malta fever, J. R. MOHLER and A. EICHHORN (*Jour. Amer. Med. Assoc., 58 (1912), No. 15, pp. 1107–1109*).—This includes a discussion of the history of Malta fever, its discovery in Texas (E. S. R., 25, p. 782), the various methods of diagnosis, and the experiments of the authors as regards the complement fixation test.

Owing to the differences of opinions which exist in regard to the agglutination test used for diagnosing this condition, the authors sought to determine the utility of the complement fixation test for this purpose. "From the results of these investigations it appears that the complement fixation test can be utilized for the diagnosis of Malta fever, and in consideration of the fact that the agglutination test is not always reliable for such purposes, the complement fixation would be of great advantage as an adjunct in the diagnosis of this malady."

A description of the complement fixation and macroscopic agglutination tests as utilized by the authors is given in detail.

Rinderpest as observed in the Philippines, W. SORRELL (*Amer. Vet. Rev., 41 (1912), No. 3, pp. 290–299, figs. 3*).—This is a description of the disease as it is encountered in the Philippine Islands, and a discussion of the various methods utilized for combating it.

A cultural method of hyperimmunizing animals for the production of anti-rinderpest serum, F. S. H. BALDREY (*Jour. Trop. Vet. Sci., 6 (1911), No. 3, pp. 251–256*).—This work shows "that anti-rinderpest serum can be prepared by the inoculation of virulent blood diluted with broth. It appears possible that an active toxin is produced and excreted into the broth by the rinderpest organisms contained in the virulent blood and by this means the results recorded are obtained. This material or probable toxin is rapidly excreted and so active that it appears to quickly inhibit any further growth of the rinderpest organism, destroying its virulence and finally killing it.

"The substance so obtained is very much more active than that obtained in virulent blood, so much so that it can not be given subcutaneously with safety on account of the extreme inflammatory condition it sets up. To use it as an hyperimmunizing agent, doses are better given intravenously and gradually increased so that the [injections are] spread over a period of some 2 months or more. The immune serum so obtained is powerful, but 15 to 20 per cent weaker than that made by massive injections of virulent blood. The method is an eminently practical one and shows a great financial saving."

Tests of anti-rinderpest serum, A. R. WARD and F. W. WOOD (*Philippine Agr. Rev. [English Ed.], 5 (1912), No. 2, pp. 75–79*).—"The experiments seem to show that anti-rinderpest serum does not prevent infection with rinderpest. On the contrary, animals injected with serum and exposed to rinderpest soon

contract the disease and pass through a more or less modified attack. [It is] shown that the blood of animals is infective during this attack."

The authors point out the inadvisability of relying upon serum to prevent an attack of this disease. Such serum has been advocated by sanitarians in various parts of Africa.

Investigations in regard to tetanus curative sera prepared according to various methods with the aid of immunity reactions and animal tests, W. SCHÜRMANN and E. SONNTAG (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 12 (1911), No. 1, pp. 1–15; abs. in Zentbl. Biochem. u. Biophys., 12 (1912), No. 23, p. 932*).—Treating horses by subcutaneous injections of toxins, i. e., bacilli and spores, yields no agglutinins or precipitins specific for the tetanus bacillus in the blood serum. The serum obtained in protective tests with animals pretreated with toxin behaved in the same manner. The protective action probably runs parallel with the antitoxin content of the serum. By giving killed or living bacteria intravenously to a rabbit a slight agglutinin, with a marked precipitin formation, took place.

The treatment of tetanus by magnesium sulphate, carbolic acid, and antitetanus serum, J. CAMUS (*Compt. Rend. Soc. Biol. [Paris], 72 (1912), No. 3, pp. 109–112; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 5 (1912), No. 3, p. 11*).—Magnesium sulphate and carbolic acid were found of no value in treating tetanus, the former having only a momentary effect upon the spasm. The serum treatment of tetanus is far better. Some tests with an antitoxic serum prepared with pepsin are also reported but the results obtained were very uncertain.

Bovine and human tuberculosis, LYDIA RABINOWITSCH (*Berlin. Klin. Wchnschr., 49 (1912), No. 16, pp. 752–754*).—It is stated that the bovine type of bacillus causes a great many cases of tuberculosis in man. Prophylaxis must therefore not be ignored in this direction.

Tuberculosis in chickens, Y. VOSGIEN (*Hyg. Viande et Lait, 6 (1912), No. 4, pp. 207–211*).—Out of 226 chickens which were seized as being tuberculous 145 on autopsy showed lesions of tuberculosis. The tuberculous processes were distributed among the following organs: Liver, 143 cases; spleen, 135; cervical ganglion, 102; lungs, 61 (1 case of tuberculosis of lungs and trachea included); bones and articulations, 46; alimentary canal, 30; peritoneum, 13; kidneys, 9; and ovaries, 6 cases.

Tuberculosis of poultry, RAYMOND and CHRÉTIEN (*Hyg. Viande et Lait, 6 (1912), No. 4, pp. 211–226, figs. 8*).—This article includes observations made in regard to the occurrence of tuberculosis in poultry as noted at the central game market at Paris. The article is illustrated with drawings of pathological preparations. The distribution and frequency of the lesions are stated and discussed.

The tuberculin test, P. FISCHER (*Proc. Amer. Vet. Med. Assoc., 48 (1911), pp. 536–556*).—A discussion of the nature of the tuberculin test and a detailed statement of the results obtained with it in the State of Ohio.

In regard to tuberculin anaphylaxis and its relation to the tuberculin reaction, T. J. VON CAPELLE (*Centbl. Bakt. [etc.], 1. Abt., Orig., 60 (1911), No. 6, pp. 531–542*).—Anaphylaxis can be produced with tuberculin because the tuberculoprotein contains an integrating substance upon which anaphylaxis depends. According to this the tuberculin reaction is an anaphylactic process. Anaphylaxis so produced can be conveyed from one animal to the other.

Upon the defense of the organism against infection by the tubercle bacillus, A. CALMETTE and C. GUÉRIN (*Ann. Inst. Pasteur, 25 (1911), No. 9, pp. 625–641*).—The serum of bovines which were hyperimmunized by repeated injections of modified (in media of ox bile) tubercle bacilli, when injected into guinea pigs, will not prevent or cure tuberculosis in these animals. When given with

attenuated or virulent bacteria it stimulates a rapid evolution of the pathological lesions in the animals. If the serum is used in large doses it may retard the pathological process, but on the other hand it will have a tendency to favor the elimination of tubercle bacilli through the regular excretory channel.

The intradermal tuberculin test, D. F. LUCKEY (*Amer. Vet. Rev., 41 (1912), No. 3, pp. 316–323*).—The intradermal test in the hands of this author gave good results, in fact, results somewhat better than those obtained by the old subcutaneous method. The method of making the test is described. The author also points out the value of keeping a history of the animals in the vicinity.

Diagnosis of pulmonary tuberculosis with regard to the new sanitary laws, O. MÜLLER (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 17, pp. 293–295, figs. 2*).—This is a description of the Königsberg method devised by Müller, Jonske, and Wiemann for diagnosing tuberculosis. This is a modification of the method of Scharr and Opalka (E. S. R., 26, p. 679), but is supposed to possess certain advantages which are described in detail. The author recommends giving an injection of cocaine at the point where the cannula is to be inserted 15 minutes before the operation. Reasons for not using the Rautmann and the Tallgren and Graae apparatus are given.

Sputum gathering methods for diagnosing tuberculosis in bovines, H. RAUTMANN (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 19, pp. 335–337*).—This is a polemic in regard to Müller's method (see above) for obtaining sputum. The author also discusses the value of his own apparatus, which is a modification of the Tallgren and Graae apparatus (E. S. R., 24, p. 84).

Preliminary report upon the injection of rabbits with protein-free (tuberculo) antigen and antigen-serum mixture, A. H. CAULFEILD (*Proc. Roy. Soc. [London], Ser. B, 84 (1911), No. B 573, pp. 390–394*).—This work is summarized as follows:

"The injection of rabbits with a saline dilution of an alcohol-ether extract of tubercle bacilli is capable of producing complement-fixation bodies to that antigen. The digestion at 37.5° C. of the alcohol-ether extract with inhibitive serum (human) for various intervals up to 1 hour does not affect the production of the specific sensitizers. The digestion at 37.5° of the alcohol-ether extract with fixation-positive serum (rabbit) for 1 hour inhibits the production of specific sensitizers. . . .

"The injection of 'bacillen-emulsion' in 2, 1.5, 0.5, and 0.005 mg. amounts failed to induce fixation bodies. The injection of 100 mg. of partially dried dead tubercle bacilli (after alcohol-ether extraction) produced after the first injection sensitizers, so that 0.1 cc. serum caused complete fixation although the injection of 0.5 mg. failed to do this. . . .

"The rabbit's blood was obtained by puncture of the ear vein and withdrawal by a 2 cc. record syringe. This has been found to be the most rapid and satisfactory method of obtaining up to 5 cc. of blood. The needle and syringe are sterilized in hot oil, the needle being then well cleared in cold sterile saline."

The results obtained in the eradication of tuberculosis from a herd by the use of tuberculosis vaccine and the Bang system, S. H. GILLILAND (*Ann. Rpt. Penn. Dept. Agr., 16 (1910), pp. 166–179; Proc. Amer. Vet. Med. Assoc., 48 (1911), pp. 477–492*).—This is the report of a series of experiments made for the purpose of eradicating tuberculosis from a herd, which originally consisted of 200 animals, comprising Holsteins, Guernseys, and grades, on the basis of the tuberculin test and the Bang method.

In 1904, when the tests were begun, 160 animals, which constituted the milking herd, were tested and showed 42 reactors, or 26.2 per cent. Nearly all of the reacting animals were in various periods of gestation and kept in separate

barns for the purpose of obtaining their offspring. The main milking herd was then distributed among four separate disinfected barns, which held from 12 to 48 animals each. In the majority of cases the milking animals were tested every 6 months until 2 negative tests were obtained and then yearly thereafter. Calves intended for future introduction into the milking herd were immunized with human tubercle bacilli intravenously injected. All new cows purchased were placed in quarantine 150 ft. from the main barns.

In the spring of 1905 the milking herd, which then consisted of 120 animals, was again tested and showed 13, or 10.8 per cent, of reactors. Five months later (November, 1905), out of 136 animals 7, or 5.1 per cent, reacted. In April, 1906, 150 animals were tested and of these 13, or 8.4 per cent, reacted, and in the following November out of 137 animals tested 5, or 3.6 per cent, gave the test. In April, 1907, 201 animals and in October of the same year 137 animals were tested, but no reactions were found. During 1908, in the months of April and November, 145 and 169 animals, respectively, were examined. In the first case the reactors present amounted to 1.4 per cent and in the latter to 1.8 per cent, which shows a reinfection of the herd. In April, 1909, no reactors were present in the herd, but about a year after this, out of a herd of 151 animals, 5 animals or 3.7 per cent reacted. The author accounts for the reinfection of the herd the second time as due to the fact that 2 valuable animals which reacted in November, 1908, were retained in the herd for a retest. "The history and cycle of the tuberculin test for these 2 animals and a few others are dealt with in detail in the original.

"[In the vaccination experiments which were conducted] since 1904 there were 184 calves vaccinated, of which 46 are in the main milking herd at the present time. Of the 143 animals that were sold for breeding purposes, for beef, or that died from lung worms, etc., post-mortem examinations were obtained on approximately 100 head and no lesions of tuberculosis were found in any except those aforementioned following the tuberculin test of 1911."

The vaccine used was made from the human type of tubercle bacillus, which was never more than 36 hours old.

Report on an experiment to produce a tolerance in cows to tubercle bacilli after injection of various products, A. J. Smith and H. Fox (*Ann. Rpt. Comr. Health Penn., 4 (1909), pt. 1, pp. 251–268*).—In these experiments 3 definitely tubercular cows, 2 which were highly suspicious, and 2 which were almost certainly free from the disease were used. The latter 2 animals served as controls, and one received no vaccine. All of the rest of the animals were given a pretreatment with tubercle bacilli in order to determine their degree of resistance toward the products. The products injected, either under the skin or intravenously, in the experiments proper were made from dead degreased tubercle bacilli used in a standardized emulsion and a salt solution extract of living tubercle bacilli in which the fat had been softened with ether.

After giving the clinical autopsical and microscopical findings the authors show that none of the above animals lived long enough to overcome the acute effects of injecting a large number of bacteria into the circulation. The animals which had tuberculosis before beginning the experiment, particularly those where the lesions were more retrogressive, stood the injections better and showed a more increased tissue resistance than those which were markedly tubercular and the remainder which had only slight lesions or none at all. The animals with active lesions are not able to accommodate much extra toxin or to stimulate to any great extent the power of antibody formation.

An active immunity is therefore very difficult to attain. The methods employed here seem only to increase the power of the tissues to passive resistance.

Combating tuberculosis in female animals, E. VAN HUFFELEN (*Handel. Vlaamsch Natuur en Geneesk. Cong., 14 (1910), pp. 250–257*).—This article deals in a general way with the prevalence of tuberculosis in female animals, chiefly cows in the Netherlands, and gives an exposition of the methods in vogue in that country for combating the disease.

Acid agglutination of bacteria, M. BENIASCH (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 12 (1912), No. 3, pp. 268–315; Jour. Amer. Med. Assoc., 57 (1911), No. 25, pp. 1998, 1999; abs. in Chem. Abs., 6 (1912), No. 7, p. 887*).—"This acid agglutination of bacteria is, if anything, more sharply specific than is agglutination by immune serums. Typhoid bacilli can be distinguished from the various strains of paratyphoid and colon bacilli with the greatest ease, and bacilli so closely related that it is difficult or impossible to distinguish them by serum agglutination are readily identified by the optimum hydrogen ion concentration of their agglutination by acids. With various strains of typhoid bacilli the agglutinability by acids and serums runs parallel, and so it seems probable that the antiserums and the acids act on the same constituent of the bacteria."

The acid agglutination of the bacteria of the paratyphoid group, POPPE (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 13 (1912), No. 2, pp. 185–191*).—The Michaelis method can be employed for identifying the bacteria representing the paratyphoid group. A differentiation of some of the lower forms in this group was not possible.

The nature and treatment of bovine piroplasmosis in Germany, H. MIESSNER (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 3 (1911), No. 4, pp. 207–230*).—This paper consists largely of discussions of the vaccination and chemotherapeutic treatment of Texas fever. A bibliography of 23 titles is appended.

Agglutination reactions during the process of hog cholera serum production, W. GILTNER (*Centbl. Bakt. [etc.], 1. Abt., Orig., 60 (1911), No. 6, pp. 552–559*).—Previously noted from another source (E. S. R., 26, p. 785).

Study of the Bacillus erysipelatis suis (Rhusiopathia suum), H. THUM (*Rev. in Vet. Jour., 68 (1912), No. 443, pp. 301–304*).—A general account, which is stated to be founded on practical experience.

In regard to the cause of equine influenza, J. BASSÉT (*Rec. Méd. Vét., 88 (1911), No. 17, pp. 546–552, fig. 3*).—A detailed statement in regard to this work, which has already been noted (E. S. R., 26, p. 384).

Concerning Ascaris megalocephala, W. GREIM (*Über Ascaris Megalocephala. Inaug. Diss., Univ. Giessen, 1910; abs. in Berlin. Tierärztl. Wchnschr., 28 (1912), No. 8, p. 141; Vet. Rec., 24 (1912), No. 1236, p. 582*).—The following are the conclusions drawn from the study of this parasite:

"The presence of *A. megalocephala* may induce symptoms of disease in the horse. The Ascaris irritates the intestinal mucous membrane by its movements. By the aid of its lip apparatus, it scratches the mucous membrane and produces small wounds. Such lesions, when numerous and situated in close proximity to one another, may lead to inflammation, ulceration, and necrotic destruction of small portions of the mucous membrane. By its individual strength the Ascaris can not perforate the intestine. The parasites live free in the lumen of the intestine; and, contrary to the views repeatedly expressed hitherto, they are not able to suck from or to hook on to the intestinal mucous membrane. The Ascaris contains toxin in its body, and disperses it into its surroundings. The effects of the toxin consist of local irritation, alteration of the nervous system, and toxic action upon the heart and blood. An affection of the kidneys in connection with the excretion of the toxin can not be demon-

strated. The pathogenic importance of the parasite renders it necessary to administer anthelmintics to the horses infected with it."

Investigations of the action of "606" on spirochetosis of fowls, A. HAUER (*Centbl. Bakt. [etc.], 1. Abt., Orig., 62 (1912), No. 6, pp. 477–496*).—The author finds that Salvarsan destroys spirochetes in fowls, its curative action being noticed as early as the day of administration. A bibliography of 31 titles is appended.

RURAL ENGINEERING.

The primer of hydraulics, F. A. SMITH (*Chicago, 1911, pp. VI+217, figs. 108*).—This publication covers the more important mathematical, physical, and mechanical principles underlying the subject of hydraulics, and gives general information, formulas, and hydraulic tables to solve problems relating to the flow of water in channels in municipal, drainage, irrigation, or other hydraulic works.

Tables for converting discharge in second-feet per square mile into run-off in depth in inches and discharge in second-feet into run-off in acre-feet (*U. S. Geol. Survey, 1910, pp. 21*).

A review of masonry dam design and construction illustrated with cross sections of 40 notable dams (*Engin. and Contract., 37 (1912), No. 21, pp. 583–594, figs. 47*).—Brief descriptions of the design and construction of these irrigation and power dams are given with statements of cost.

Fourth biennial report of the state engineer and of the Carey Land Act Board of the State of Montana, 1909–10, J. W. WADE (*Bien. Rpt. State Engin. Mont., 4 (1909–10), pp. 18*).—This report makes a brief statement of work by the Montana state engineer's office in 1909–10, and discusses the physical and financial condition of irrigation projects under the Carey Act in Montana in 1910.

Tenth biennial report of the state engineer of Wyoming, 1909–10, C. T. JOHNSTON (*Bien. Rpt. State Engin. Wyo., 10 (1909–10), pp. 211, pls. 9, fig. 1*).—This report deals with the irrigation administration in Wyoming in 1909–10, gives lists of permits to appropriate irrigation water, tables of stream gagings, reports of superintendents of water divisions, and reports of the progress of reclamation works in the State.

Review of irrigation in India in 1909–10, W. B. GORDON (*Sup. Gaz. India, 1911, June 10, pp. 1099–1121*).—Tabulated data are reported showing the financial and other results of irrigation works in operation in India in 1909–10. The total area irrigated was about 22,500,000 acres, and the value of the crops raised thereon is estimated at about 116 per cent of the capital outlay.

Volume of water required in irrigation, M. RINGELMANN (*Rev. Hort. [Paris], 84 (1912), No. 7, pp. 160–162*).—It is stated in this article that the soil characteristics, the nature and age of the vegetation, and existing meteorological conditions largely govern the amount and frequency of irrigation required. The results of observations along these lines are given from different sources.

The use of slope-stake tables in irrigation work, R. C. PIERCE (*Engin. News, 67 (1912), No. 21, pp. 986, 987*).—The author explains the use of tables giving the distances out to the cut and fill stakes and the corresponding cuts in cross-sectioning irrigation ditches. The process, he claims, eliminates the errors in the mental calculations of the rodman and tapeman, reduces talking and signaling to a minimum, and saves time.

[An irrigation pumping plant], C. R. SESSIONS (*Pacific Rural Press, 83 (1912), No. 20, p. 467, fig. 1*).—A simple and economical irrigation pumping

outfit is described, consisting essentially of a 15-in. centrifugal pump directly connected to a single cylinder 30-horsepower distillate engine. The plant cost, completely installed, $1,800, has a capacity of 6,500 gal. per minute, and it is claimed can irrigate about 10 acres of land in a 12-hour run.

Automatic hydraulic pumping engine (*Northwest Hort., 25 (1912), No. 5, pp. 129, 130*).—An improved type of hydraulic ram is described, which, it is claimed, can be operated in larger units and under a larger range of conditions than the old type, and develops under ordinary working conditions from 75 to 95 per cent of efficiency. The following improvements are suggested for insuring high efficiency: A large waterway area through the valves, approximately equal to the area of the supply pipe, a small valve movement (maximum 1 in.), valves smoothly curved for easy passage of the water, close relative position of waste and discharge valves, eliminating the column of dead water to be started and stopped at each stroke, and the downward discharge using all available head.

Practical methods of draining irrigated lands, R. A. Hart (*Nat. Land and Irrig. Jour., 5 (1912), No. 4, pp. 8–11, figs. 7*).—Attention is called to the frequent importance of draining irrigated lands, and the methods of construction of open canal and covered tile drains applicable to the existing conditions in irrigated sections are briefly outlined. Special attention is paid to covered tile drains, of which 3 systems are discussed—the natural system, gridiron system, and intercepting system. A number of typical examples of tile drainage of irrigated lands are given, pointing out the special features. A cost of from $10 to $30 per acre, with an average of $15 per acre, is claimed.

Irregular channels retard the flow of water, M. E. Briggs (*Nat. Land and Irrig. Jour., 5 (1912), No. 5, p. 31, figs. 2*).—It is pointed out that a correct drainage ditch is obtained only when dug in a manner which will not disturb the earth in the banks or bottom, and with sufficient berm and side slopes to prevent slipping and caving of banks and waste banks when under water action.

Tile drainage, J. A. Jeffery (*Michigan Sta. Spec. Bul. 56, pp. 45, figs. 31*).—This bulletin explains the working principles of tile drainage, discusses the general planning and location, with special reference to silt basins, and points out the benefits of tile drainage. The use of the drainage level and of simple leveling devices for establishing grades is explained and the entire procedure of making and mapping the survey and of making the necessary computations for a tile drainage system is outlined, with examples of notes and profiles. The process of constructing a tile drain is outlined in detail.

New York state highways (*Municipal Jour., 32 (1912), No. 20, pp. 739–747, figs. 16*).—This article deals with the organization of the New York State Highway Commission, road maintenance, types of road construction, and road details and specifications, and discusses recent typical road construction work.

Portland cement concrete roads, L. W. Page (*Engin. Rec., 65 (1912), No. 21, pp. 578, 579*).—This is a paper read before the American Association of Portland Cement Manufacturers, May 9, in which general suggestions are given relative to the construction of concrete roads and pavements. The advantages of concrete for roads and pavements pointed out are its ability to resist shear, to transmit normal pressure over a large area of subgrade, and to act as an arch to sustain normal pressure.

The storage of Portland cement (*Irrig. Age, 27 (1912), No. 6, pp. 215, 216, figs. 2*).—Attention is called to the importance of carefully storing Portland cement for protection against moisture, and methods of construction of temporary and permanent storage buildings are briefly outlined.

Agricultural machines, K. WALTHER (*Die landwirtschaftlichen Maschinen. Leipsic, 1910, vol. 2, pp. 120, figs. 64; 1911, vol. 3, pp. 156, pl. 1, figs. 91*).—These are the second and third volumes of this series, the first having been previously noted (E. S. R., 21, p. 186).

They treat of harvesting machinery and machinery for the cleaning, storing, preparing for use, etc., of the different crops after harvesting, describing the construction and methods of operation of mowing machines, binders, hay rakes, tedders and loaders, potato and turnip diggers, threshing machines, grain cleaning and sorting machines, hay presses, and feed preparing machines. There is also included a chapter on agricultural motors.

Agricultural machinery, G. COUPAN (*Bul. Soc. Agr. France, 1912, Apr. 15, pp. 404–413; May 1, pp. 457–461, figs. 7*).—Several agricultural machines are briefly described, among which are ground and crop cultivators, tractors, drills, and harvesters. The mechanical theories for some types of potato diggers and drills are illustrated and explained.

The efficiency of the farm tractor, R. BERESFORD (*Iowa Agr., 12 (1912), No. 7, pp. 12–14, figs. 2*).—The author computes the cost of plowing by gas tractor at 40 cts. per acre, and by horses at 60 cts. per acre. He calls attention to a number of cases where gas tractors have proved efficient and profitable on farms.

[A 24-hour test of a tractor] (*Impl. and Mach. Rev., 37 (1912), No. 444, pp. 1573, 1574*).—A 24-hour test was made of a 50-brake horsepower, 4-cylinder, 3-speed motor in plowing and pressing, the implements employed being a 4-furrow plow and a 36-in. 5-wheel land presser.

The results show that 20 acres 89 sq. yds. of land were plowed and pressed in 24 hours. The amount of gasoline used was 69½ gal., or about 3½ gal. per acre, and the amount of lubricating oil used 1¾ pt. per acre. The opinion is presented that a light, powerful, speedy tractor, drawing a comparatively small plow, is more efficient than a slower, heavier machine, pulling a greater number of plows.

An effective stumping machine (*Queensland Agr. Jour., 28 (1912), No. 4, pp. 290–292, figs. 2*).—A stump puller and its method of operation are described. It consists essentially of an iron and wood frame supporting a wooden drum or roller which revolves by lever action and operates a block and tackle and steel cable pulling system. An illustration is given showing the working parts in detail.

[Trials of corn and seed drills] (*Impl. and Mach. Rev., 38 (1912), No. 445, pp. 70–74, figs. 9*).—The method and results of tests on several makes of corn and seed drills for accuracy, even distribution of seed, simplicity, and general efficiency are given with the constructive details and the price of each machine.

Milking with machines (*Wiener Landw. Ztg., 62 (1912), No. 27, pp. 339, 340*).—A discussion is given of the relative merits of suction and pressure milking machines, the advantages of light weight, simplicity, ease of adjustment, and speed in milking being conceded to the suction machines, and the advantages of steady and systematic action, easy control, ready cleaning and airing, complete milking, and easiness on the cow to the pressure machines. Several different makes of these two machines are described.

Farm power, L. W. CHASE (*Deseret Farmer, 7 (1912), No. 28, p. 651, fig. 1*).—Results of tests conducted at the University of Nebraska on gasoline engines, showing the gasoline consumed in different kinds of farm work, are reported.

From these tests and other computations it is estimated that 1 gal. of gasoline in a 3-horsepower engine will complete any one of the following operations:

Pump 2,454 gal. of water from a 43-ft. well, shell 264 bu. of corn, grind 48.6 bu. of corn, separate the milk from 300 cows, do 20 weekly washings, grind 20 sickles, or operate the machinery in harvesting 4 acres of grain.

Power that is needed (*Farm Machinery, 1912, No. 107½, p. 15*).—Data are given from actual tests of gasoline engines showing the power required for driving the different machinery about the farm.

[Generation of electricity by wind power in Denmark], V. MAGERSTEIN (*Monatsh. Landw., 4 (1911), No. 2, pp. 35–40, figs. 3*).—Attention is called to the use of wind power for generating electrical energy for farm use, and a brief description and discussion of private and central plants are given with a short statement of cost.

What electricity means to the farmer, P. A. BATES (*Nat. Land. and Irrig. Jour., 5 (1912), No. 5, pp. 79, figs. 5*).—This article deals with the use of electricity on the farm, pointing out the advantages of immediate availability, adaptability, simplicity, economy, and reliability, and comparing farm work as done by electricity and as done by the old hand methods.

Electric light for the farm, N. H. SCHNEIDER (*New York and London, 1911, pp. IX+85+VIII+86, figs. 65*).—This work consists of two parts.

Part 1 contains practical information on small, low-voltage electric light plants, operated by storage batteries, suitable for farms, isolated houses, and country homes in general, explaining in detail how to estimate the size and number of lights required, their best location, and the most convenient means of control, and how to estimate the required capacity of, install, and operate the plant necessary to furnish the electric current. Part 2 deals with the wiring of houses for electric lights, with special reference to low-voltage battery systems, giving information on planning and installing the general wiring, installing the lights, switches, etc., methods of wiring for special buildings and to suit unusual conditions, and the general estimating of wiring material required. A chapter is included describing some typical plants.

Lighting system for the farm (*Farmer, 31 (1912), No. 19, pp. 686, 688, figs. 2*).—A description is given of the various modern systems used for supplying artificial light to the farm home, viz, acetylene gas, gasoline gas, electricity, blaugas, and improved lamp systems.

The electric system is considered the most efficient, although it has the highest initial cost. The following approximate costs are given for average-sized installations of each system: Acetylene gas $250, gasoline gas $100 and up, electricity from $350 to $450, and blaugas from $100 to $200.

Lighting with alcohol and kerosene, R. M. WEST (*Minnesota Sta. Bul. 126, pp. 97–127, figs. 4*).—The work outlined in this bulletin is primarily intended to determine the relative lighting values of industrial alcohol and kerosene, and in connection with this many factors of secondary importance are considered, such as safety, health, eyesight, cleanliness, cost of maintenance, original cost of lamp, and ease of manipulation. Five portable lamps, including both the mantle and wick types, and 1 lamp intended especially for alcohol, were selected for comparison and when possible both alcohol and kerosene were burned in the same lamp with the same mantle. The method of light measurements employed was the comparison of the lights with the light of a standard English candle by means of an open-bar photometer.

Tabulated results of these tests are given and are graphically represented by 6 sets of curves showing the ratio of the candlepower of the light to the candlepower hours per gallon of fuel. A seventh set of curves estimates the number of candlepower hours obtainable for $1 in the case of the common illuminants, and shows that with kerosene at 6½ cts. per gallon a 16 candlepower light may

be maintained giving 17,000 candlepower hours for $1, while in order to give the same economy, alcohol would have to sell at from 3 to 5½ cts. per gallon, gas at about 56 cts. per 1,000 cu. ft., and electricity at 9 cts. per kilowatt hour.

The conclusions drawn are that with all lamps tested, the greatest amount of light per unit of fuel is obtained at the maximum candlepower which the light will give; kerosene is uneconomical and inefficient when burned in the old-style lamp; mantle lamps for either fuel are efficient but require greater care in manipulation; with each fuel burned in the lamp best suited to its use, kerosene has the higher efficiency; the lighting value of alcohol is approximately one-half that of kerosene when both are burned in the same lamp under the same mantle; and alcohol burned in the special alcohol lamp gives only a slightly lower efficiency than kerosene in mantle lamps.

As regards the further improvement of lighting apparatus, it is predicted that while the absolute amount of light obtainable with these fuels may be materially increased, it is doubtful if their relative lighting values will be greatly affected.

Plumbing for the farm home (*Farmer, 31 (1912), No. 19, pp. 688, figs. 3*).—Systems of plumbing and sewage disposal for the farm home are dealt with, a cheap and simple system of sewage disposal by septic tank and filter beds being described, which, it is stated, would cost about $60.

RURAL ECONOMICS.

Cooperation in the South, F. G. Miner (*Farmers' Rev., 44 (1912), No. 19, p. 4, figs. 2*).—This article illustrates the principles of cooperation among farmers by showing what a cooperative organization of truck growers near Norfolk, Va., has done for its members in a financial way within the last few years. The organization has found it to be more advantageous to have all buyers come to its stations, where the products are sold f. o. b. than to ship direct to commercial firms. They have a shipping inspector and the inspection he gives is accepted as bona fide by the purchasers.

In addition to buying and selling for its members, the association loans money to them upon certain conditions.

Grange cooperation at work: How fire insurance companies and national banks are run by farmers, J. Alvin (*Country Gent., 77 (1912), No. 20, pp. 4, 5, 29, fig. 1*).—This article points out by a number of illustrations how fire insurance and banking both come within the scope of grange cooperation in Pennsylvania. Of the 200 or more mutual insurance companies in the State, 18 are carrying risks of over $60,000,000 and are managed entirely by members of the grange.

Under the plan in operation when a members applies for insurance, an officer of the company examines his property and estimates its value. Should it be worth $1,500, for example, insurance is granted to the amount of $1,000, on giving a note for $50 and paying a 5 per cent assessment thereon, or $2.50. All other assessments are made annually as they may be needed to meet the losses. At the end of 5 years, the note, which is called a premium note and is the basis of the company's resources, is returned.

The principal advantage of such insurance is in the elimination of the overhead charge which is usually the largest item of insurance cost. For instance, one mutual fire insurance company carried risks in 1911 of over $500,000 and the total expenses amounted to only $51.99. Another company was carrying, on January 1, 1912, insurance to the amount of $11,716,079, and the average expense per year for the last 37 years is shown to have been $1,641.31 and

the average cost of insurance per $1,000 for 1 year $1.90. Still another company is carrying $4,139,950 of insurance and its annual expenses, including salaries and all items, are less than $2,600.

Data as to the work and success of a number of other insurance companies, together with that of the grange banks, are given.

The cost of production of farm crops, F. W. GIST (*Proc. Middle Tenn. Farmers' Inst., 10 (1911), pp. 81-99*).—An address delivered at the tenth annual session of the middle Tennessee Farmers' Institute, Nashville, Tenn., December 5-7, 1911, in which the author discusses and points out in detail, as a result of his investigations, some conclusions as to what ought to be included in the cost of production as it relates to the business of farming.

A rural survey in Missouri (*New York [1912], pp. 42, figs. 22*).—This pamphlet presents the results of a social and economic survey made by the Department of Church and Country Life of the Board of Home Missions of the Presbyterian Church. It includes Adair, Sullivan, and Knox counties, Missouri, comprising a total area of 1,719 square miles with a population of 53,701. Detailed information is reported for each township as to its topography, economic conditions, population, and educational, social, and religious conditions and activities.

Of the total population, 35,495 live in the country, 5,551 in 23 villages under 750 in population, and the remaining 12,655 in towns of more than 750 population. The population in the rural districts shows a decrease, while that in townships has increased, but the total population of the three counties is 1,788 less in 1910 than in 1900. The reasons assigned for this condition are (1) smaller families, (2) the increased use of farm machinery, lessening the need of farm hands, (3) the increased value of land, which has induced some farmers (as a rule the owners of the small farm) to sell out and go to cheaper lands in the West, and (4) the fact that the younger generation has been seeking greater opportunities in towns and in the cheaper lands elsewhere.

About 85 per cent of the farmers own the farms they operate, the remainder being tenants. Agricultural laborers receive from $20 to $30 and "keep" per month. The average family is shown to spend annually $771 on itself, $13.72 on its school, $6 on its roads, and $3.18 on its church. It is stated that only 29 per cent of the total population belong to a church, and that 44 per cent of the tenants, 78 per cent of the hired men, 65 per cent of farmers who own 20 acres of land, 46 per cent of farmers with 40 acres, 36 per cent with 60 acres, 27 per cent with 100 acres, 20 per cent with 200 acres, and 18 per cent with 500 acres do not attend. The question is raised whether the poor man does not want to go to church or whether the church makes no effort to get him to do so.

[Agricultural production in Victoria], A. M. LAUGHTON (*Victorian Yearbook, 31 (1910–11), pp. 623–707*).—Notes, statistics, and detailed accounts of agricultural production of the State for 1910–11, with comparisons with former years and with other States and countries, are here presented, together with a brief summary of the work in progress at the agricultural schools, colleges, and experiment stations.

It is noted that the number of persons engaged in agricultural pursuits in 1901 was 78,539 males and 17,381 females, and that the persons employed in farming, dairying, and pastoral holdings in 1910 numbered 99,948 males and 54,083 females, the total population being 651,093 males and 656,305 females. The prevalent rates of wages paid (with rations) during 1910–11 were: Plowmen 25s. per week, farm laborers 20s., milkers 20s., harvest hands 6s. per day, and threshing machine hands 8d. per hour. The area under the 5 principal

crops, their production, and the proportion of each to the population are shown in the following table:

Area, production, and average per head of population of the 5 principal crops in Victoria, 1901 and 1911.

Crops.	Area.		Production.		Average production per head of population.	
	1901	1911	1901	1911	1901	1911
	Acres.	*Acres.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*
Wheat	2,017,321	2,398,089	17,847,321	34,813,019	14.91	26.63
Oats	362,689	392,681	9,582,332	9,699,127	8.00	7.42
Barley	58,853	52,687	1,215,478	1,340,387	1.02	1.03
			Tons.	*Tons.*	*Tons.*	*Tons.*
Potatoes	38,477	62,904	123,126	163,312	0.10	0.13
Hay	502,105	832,669	677,757	1,292,410	.57	.99

The number of dairy cows is shown to have increased from 515,179 in 1903 to 668,777 in 1910, the production of butter from 46,685,727 lbs. to 70,603,787 lbs. and the number of cream separators in use from 8,986 to 27,307. The Victorian wool clip for the year from sheep amounted to 73,959,226 lbs., from lambs to 6,115,044 lbs. During 1910 there were exported to foreign countries 164,213,073 lbs. of wool, of which 76,068,574 lbs. had been imported from other States.

Agriculture [in New Zealand], M. FRASER (*New Zeal. Off. Yearbook 1911, pp. 551–565*).—Notes and statistics showing the land in cultivation and acreage under various crops with their yields are here presented. The area under wheat in 1911 was 322,167 acres, oats 302.827 acres, with the average yield 25.73 bu. and 33.41 bu., respectively, per acre.

Agriculture in New Zealand, M. MURPHY (*New Zeal. Off. Yearbook 1911, pp. 785–815*).—A résumé of agricultural conditions in New Zealand for 1911, showing the acreage production of a number of crops, growth of the live stock and dairying industries, and the farming outlook of the Dominion in general (E. S. R., 25, p. 391).

[Papers on Danish agriculture] (*Tidsskr. Landökonomi, 1911, Nos. 7, pp. 457–470; 8, pp. 521–538; 9, pp. 569–586, 587–602; 12, pp. 681–704; 13, pp. 737–749*).—The usual summaries and reviews of the main branches of Danish agriculture are here presented. Particular attention may be directed to the following: Horse Raising, by J. Jensen (pp. 457–470); Animal Husbandry, by A. Appel (pp. 521–538, 587–602); Agricultural Crops, by K. Hansen (pp. 569–586); Agricultural Imports and Exports, by N. C. Christensen (pp. 681–704); and Butter Exports 1910–11, by B. Böggild (pp. 737–749).

Agriculture and forestry [in Austria] (*Österr. Statis. Handb., 29 (1910), pp. 120–147*).—Official statistics are presented regarding agriculture and forestry in Austria, showing in particular the basis of land taxation and the influence it has on the different types of farming, for example, the effect it has upon the acreage in field crops, meadows, pasture lands, gardens, vineyards, etc.

[Agricultural statistics in Japan] (*Statis. Rpt. Dept. Agr. and Com. Japan, 27 (1912), pp. 1–108*).—A statistical report, showing the area, production, yield, etc., of all kinds of farm crops in Japan, and how they are distributed, together with data as to poultry, eggs, live stock, and other farm activities of the country (E. S. R., 24, p. 493).

Wholesale prices in Canada, S. F. CULVER (*Daily Cons. and Trade Rpts. [U. S.], 15 (1912), No. 115, pp. 618, 619*).—This report brings out the fact that wholesale prices in Canada reached during 1911 a general level higher than in any previous year within the present generation. The prices of grains and fodder increased 5.8 per cent over 1910, fish 1.5 per cent, and other foods 11.8 per cent, although the prices of animals and meats decreased 10.2 per cent and dairy products 0.9 per cent. This decline is attributed to feed shortage. Imported foods, including sugar, were decidedly higher. Potatoes sold at $1.24 a bushel, compared with 58.3 cents in 1910. Prices of flour and apples were lower while peaches and pears were higher than in 1910.

Prices and wages in India (*Prices and Wages India, 28 (1911), pp. VI+230*).—Tabular statements giving details as to average annual retail prices of the leading crops and the prices of staple articles of import and export in 1873 and from 1886 to 1911 in British India, together with statements as to average monthly wages of skilled and unskilled labor at the end of 1873 and of each year since 1886.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 14 (1912), No. 5, pp. 33–40, figs. 2*).—Tables and notes are given showing cotton acreage and yield per acre in 1911, by States; crop conditions May 1, 1912, with comparisons; the mean dates when the planting of specified crops begins, is most general, and ends, by States; farm value of important products on particular dates, by States; production, marketings, variation in prices of eggs, and averages paid to producers in the United States; causes and extent of cotton damage, 1909–1911; mileage operated by railroads making organized efforts to promote agriculture; monthly receipts and stocks of eggs and poultry in the United States; range of prices of agricultural products at important markets; condition in terms of prospective yield per acre of a number of crops, based upon averages for the five years, 1906–1910; and temperature and precipitation statistics.

It is noted that 30 per cent of the farmers of the corn area of the United States tested their seed corn with an average germination of 85.2 per cent.

AGRICULTURAL EDUCATION.

How the States may aid their farmers, A. C. TRUE (*Country Gent., 77 (1912), No. 18, p. 6*).—The varied functions performed by state departments of agriculture are briefly mentioned, and their functions under an ideal system of state government are discussed. According to this system state departments of agriculture would be considered as branches of state governments the fundamental business of which would be the execution of the laws relating to agriculture, involving, for example, the control of fertilizers, feeding stuffs, plant and animal diseases, injurious insects, management of state forests, fairs, etc. It should also be their business to provide a method for the regular collection and dissemination of economic data relating to agriculture and rural communities, by thoroughly trained statisticians and economists. They should be relieved of responsibility for farmers' institutes and other forms of educational extension, as well as for research work, which are lines of work more properly belonging to the agricultural colleges and experiment stations, and, in turn, these latter institutions should be freed from police duties and other administrative functions. "The great lines of cleavage for the experiment stations, agricultural colleges, and state departments of agriculture are indicated by the terms research, education, and administration," but in each State there should be worked out a system of coordination and cooperation among all public agencies for the advancement of agriculture.

[Agricultural instruction in general, and its adaptation, particularly of rural primary instruction, to the agricultural population of the country].

A. C. Le Cocq (*Rev. Agron. [Portugal], 9 (1911), No. 1–6, pp. 44–94*).—In this article the author discusses the attributes, utility, and special features of agricultural education. He concludes (1) that in a general way the essential aim of this instruction should be to prepare and adapt the agricultural population of the country to the rural life and to the successful development of the agricultural industry; (2) that it should comprise rural elementary, professional, technical, and higher or scientific, special and itinerant instruction for adults, and normal agricultural instruction. The provisions of the law of December 21, 1901, with reference to agricultural instruction now in force are stated, from which it appears that the present organization corresponds almost completely with the plan outlined by the author with the exception that the itinerant instruction is provided for as a secondary function of the regional agronomes or the experiment stations, and no provision is made for the normal agricultural instruction.

Correlation of industrial and academic subjects in rural schools, Ella G. Agnew (*Hampton Leaflets, 6 (1912), No. 6, pp. 8*).—This leaflet has been compiled for the use of rural teachers, especially those in whose schools canning clubs are to be organized. The author describes the preparation of the cold frame and suggests how the growing of tomatoes may be correlated with the work in manual training, language, composition, spelling, drawing, arithmetic, soils in relation to agriculture, and physiology.

Forestry in agriculture, E. R. Jackson (*Vocational Ed., 1 (1912), No. 3, pp. 184–192, figs. 5*).—An outline is here given of a one month's course in elementary forestry, given last spring in the Baltimore County Agricultural High School as a part of the course in farm crops. The course included recitations, field trips to a nearby woodlot, and studies of forest and woodlot conditions in the vicinity.

Forestry in geography, E. R. Jackson (*School Sci. and Math., 12 (1912), No. 4, pp. 271–277*).—In this address, which was delivered at the 1911 session of the summer school of the University of Virginia, the meaning of geography, distribution and character of forests in the United States, national forests and national parks, the influence of forests upon topography, relations of forests to commerce, and the lesson of conservation, are considered.

The text-book of agricultural education and rural life: Agricultural words (*Columbus, Ohio: Assoc. Adv. Agr. Ed. [1912], pp. 20*).—This is a list of words commonly used in the teaching and practice of agriculture, and is intended to form the basis for the agricultural spelling contests conducted under the auspices of the Ohio Association for the Advancement of Agricultural Teaching.

A practical course in botany, Eliza F. Andrews (*New York, Cincinnati, and Chicago [1911], pp. IX+374, pls. 15, figs. 511*).—In preparing this high school text-book of botany the author's aim was "to bring the study of botany into closer touch with the practical business of life by stressing its relations with agriculture, economics, and, in certain of its aspects, with sanitation."

The materials selected for experiment and illustration are those which are familiar and easily obtained, largely of the common cultivated kinds of plants. The study begins with the seed, follows with germination and growth, and then proceeds with roots, stems, and the other parts of the plant, the response of the plant to its surroundings, closing with a chapter on cryptogams and a very brief consideration of systematic botany.

The book contains numerous practical questions, many suggestions for field work, and outlines for 86 experiments.

Experiments with soils, J. W. Hungate (*Dept. Agr. State Normal School [Cheney, Wash.], Bul. A, No. 1, 1912, pp. 16, figs. 2*).—This bulletin has been prepared to assist the rural teacher in presenting in a very elementary way

the subject of soils and their care. Lists of laboratory equipment, references to useful soil literature, and 16 exercises on soils are given. Most of the exercises are followed by a brief discussion of the main principle involved.

A seventh grade soil experiment, C. F. PHIPPS (*Nature-Study Rev., 8 (1912), No. 4, pp. 154–156*).—A simple experiment in soil analysis is described which may be used in the seventh grade to correlate its science work with that of previous grades.

Manual of laboratory exercises in farm crops, M. L. FISHER (*Lafayette, Ind.: Purdue Univ., 1911, pp. 16*).—These exercises are the results of several years of trial in the laboratory of exercises suited to the lectures accompanying 2 of the agronomy courses in Purdue University. The exercises include a study of vitality of seeds of different ages, determining the pure and germinable seed in a sample, an introductory study of clover and weed seeds, determining the percentage of hull in different varieties of oats, a study of mature wheat, rye, barley, emmer, and speltz heads, and the mature plant of oats, effect of temperature on germination, field study of clovers and grasses, inspection of field plats, identification of weeds and weed seeds, determination of moisture in grain, comparative grain judging, and commercial seed testing.

Corn (*W. Va. School Agr., 2 (1912), No. 7, pp. 133–161, figs. 13*).—This bulletin discusses the history and types of corn, improvement of the crop, cultural methods, testing seed corn, selecting seed corn in the field, judging and scoring corn, some injurious insects, and corn products. A practicum is outlined and supplementary references for the further study of corn are given.

The study of birds with a camera, R. W. HEGNER (*Nature-Study Rev., 8 (1912), No. 4, pp. 132–137, figs. 3*).—The methods employed in photographing birds' nests and adult wild birds to prove that no elaborate apparatus or exceptional skill are necessary to obtain first-class results.

Alabama Bird Day book (*Montgomery, Ala.: Dept. Game and Fish, 1912, pp. 64, pls. 10*).—This book contains a suggested program for Bird Day, bird poems, and brief studies of birds' eggs and of birds found in Alabama.

Suggestions for crayfish study, MARGARET W. TAGGART (*Nature-Study Rev., 8 (1912), No. 3, pp. 104–110, fig. 1*).—This is a study of the crayfish, followed by a series of 15 problems on collecting the crayfish, its habits, etc.

The insect life of pond and stream, P. S. WELCH (*Nature-Study Rev., 8 (1912), No. 4, pp. 139–144, figs. 5*).—This article gives instructions as to where and when to collect water insects, how to make observations of these insects in their native haunts, general methods of collecting, necessary collecting apparatus, and general methods of rearing, including directions for making and caring for aquariums for insects living in quiet water and those living in running water.

The horse, A. W. NOLAN (*W. Va. School Agr., 2 (1912), No. 5, pp. 91–109, figs. 7*).—This bulletin comprises 6 lessons on breeds and types of horses, judging a horse, feeding and care of horses, good horsemanship, and diseases of the horse. Some of the lessons include practical exercises.

Sheep and swine, A. W. NOLAN (*W. Va. School Agr., 2 (1912), No. 6, pp. 113–129, figs. 9*).—This bulletin contains 8 lessons, together with practical exercises, on the history and breeds of sheep, judging, care and feeding of sheep, care of lambs, and swine history, types and breeds and feeding and management.

Annual report, 1911, Winnebago County schools, O. J. KERN (*Ann. Rpt. Winnebago Co. [Ill.] Schools, 1911, pp. 96, figs. 101*).—The author compares the cost of the Seward and Harlem consolidated schools with that of the other schools of the county, and describes some features of their work. Other chapters are devoted to outdoor and indoor improvement and nature-study agriculture, including reports of school garden activities in the spring of 1911, the work of

the Rockford soil experiment field, boys' corn and judging contests, and organizations in Winnebago County for country life.

A school for colonial science, A. GRADENWITZ (*Sci. Amer. Sup., 73 (1912), No. 1893, pp. 232, 233, figs. 6*).—The author gives an illustrated account of the equipment and work of the German Colonial Academy at Witzenhausen, the main object of which is to train pupils for the various economic pursuits open to the individual colonist.

The meaning of extension work, W. E. GARRISON (*Col. Rec. [N. Mex. Col. Agr.], 5 (1911), No. 2, pp. 1–4*).—Extension work is discussed and the following forms are briefly described: Farmers' institutes; boys' and girls' clubs; demonstration work; lectures, conferences, and exhibits in connection with the county fair, etc.; short courses at the college; demonstration trains; and correspondence courses.

An act providing for agricultural extension in Indiana, G. I. CHRISTIE (*Purdue Univ., Dept. Agr. Ext. A. E. Form 14, 1911, pp. 7*).—The full text of the 1911 law, together with a discussion of those sections relating to county farmers' institutes, is given.

The boys' and girls' industrial club of New Mexico (*Col. Rec. [N. Mex. Col. Agr.], 5 (1911), No. 2, pp. 4–10*).—An account is given of the history of the club, its purpose, contests, and prizes.

Constitution and suggestions for organizing county boys' and girls' industrial clubs of New Mexico (*Col. Rec. [N. Mex. Col. Agr.], 5 (1911), No. 2, pp. 11–14*).

Constitution and directions for organizing local boys' and girls' industrial clubs of New Mexico, W. T. CONWAY (*Col. Rec. [N. Mex. Col. Agr.], 5 (1911), No. 2, pp. 15–17*).

[Oklahoma boys' and girls' junior agricultural clubs] (*Bul. Okla. Agr. and Mech. Col., 7 (1910), No. 11, pp. 10; 8 (1911), Nos. 17, pp. 7, figs. 7; 18, pp. 15, figs. 9; 19, pp. 7; 20, pp. 15, figs. 10; 21, pp. 3; 22, pp. 16, figs. 14; 24, pp. 13, fig. 1; 8 (1912), Nos. 27, pp. 4; 28, pp. 4; 29, pp. 4, fig. 1; 30, pp. 4; 31, pp. 4; 32, pp. 4; 33, pp. 4; 34, pp. 4, figs. 2*).—This series of bulletins is being published for the members of the Oklahoma Junior Agricultural Clubs, especially for contest work, and give instruction concerning plans for the organization of boys' and girls' agricultural clubs, sewing, cooking, butter making, milk testing and dairy herd records, poultry raising, growing cotton, corn, Kafir corn, milo maize, broom corn, vegetables, flowers, and peanuts, home canning, and hog selection and feeding.

Idaho potato culture clubs, W. H. OLIN (*Col. Agr., Univ. Idaho Ext. Bul. 1, 1912, pp. 15, figs. 6*).—Directions are given for the organization, as well as rules and regulations, of Idaho potato culture clubs.

Corn-growing contest for boys (*Penn. State Col., Dept. Agr. Ext. Circ. [1911], pp. 4*).—An outline for corn-growing contests in boys' organizations in cooperation with the Pennsylvania State College is suggested.

Results of Georgia boys' corn club work in 1911, J. P. CAMPBELL (*Bul. Univ. Ga., 1912, No. 175, pp. 24, figs. 6*).—The author gives an account of the history of the corn club movement in Georgia, the promotion and maintenance of boys' corn club work, district organizers of corn clubs, and results for 1911.

The organization of girls' clubs, MARY E. CRESWELL (*Bul. Univ. Ga., 1912, No. 174, pp. 8, figs. 2*).—Directions are given for organizing girls' canning and poultry clubs in Georgia in 1912.

Stock judging contests for boys at county fairs, D. O. THOMPSON (*Purdue Univ., Dept. Agr. Ext. Bul. 4, 1912, pp. 12, figs. 6*).—This is a suggested announcement as to the contests to be held cooperatively by Purdue University and county fair associations in Indiana.

County fair stock judging contests for boys, J. H. SKINNER and G. I. CHRISTIE ([*Purdue Univ., Dept. Agr. Ext. Pamphlet*], *pp. 4*).—Rules, regulations, and other suggestions for conducting these contests are given.

County school fairs in Virginia, T. S. SETTLE (*Richmond, Va.: Dept. Pub. Instr., 1912, pp. 55, figs. 11*).—A typical county school fair is described and the history of the movement given. In 1911 there were 25 county fairs held, 10,000 school children competed for $7,000 worth of prizes, and between 30,000 and 40,000 people attended. Detailed suggestions are made for conducting a county school fair, preparing premium lists for literary work, agriculture, home economics, manual training, and athletics, and preparing exhibits in the various classes, including score cards for judging the various articles exhibited.

Growing children in California gardens, C. A. STEBBINS (*Nature-Study Rev., 8 (1912), No. 2, pp. 67–74, figs. 2*).—An account is given of school garden work in the Ohio State Normal School, also of the plan of the University of California to make school life a copy of the community life.

Worcester garden city plan; or, the good citizens' factory, R. J. FLOODY (*Nature-Study Rev., 8 (1912), No. 4, pp. 145–150, figs. 3*).—This is a description of the garden city plan and an account of its development, object, and influence since it was started 5 years ago under the auspices of the Worcester Social Settlement in the "island district" of Worcester, Mass.

The garden city consists of a large group or city of little gardens, 10 by 20 ft., with streets, boulevards, squares, etc., like a miniature city. Dumps and vacant lots have been used. Each child is charged the sum of 5 cents for his garden, and given 5 packages of seeds and the ownership of all he raises. There are now 4 of these garden cities in which last season there were 1,000 young gardeners.

MISCELLANEOUS.

Twenty-second Annual Report of Alabama College Station, 1909 (*Alabama Col. Sta. Rpt. 1909, pp. 31*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1909, and reports of the director and heads of departments on the work of the station during the year.

Twenty-third Annual Report of Alabama College Station, 1910 (*Alabama Col. Sta. Rpt. 1910, pp. 32*).—This contains data corresponding to the above for the fiscal year ended June 30, 1910.

Twenty-fourth Annual Report of Colorado Station, 1911 (*Colorado Sta. Rpt. 1911, pp. 75*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1911, a report of the director on the work and publications of the station, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue.

Annual Report of Florida Station, 1911 (*Florida Sta. Rpt. 1911, pp. CVIII+XII, figs. 31*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1911, a list of the publications of the year, a general review of the work of the station during the year, departmental reports, and a list of the periodicals received by the station. Most of the experimental work reported is abstracted elsewhere in this issue.

Twenty-fourth Annual Report of Illinois Station, 1911 (*Illinois Sta. Rpt. 1911, pp. 16*).—This contains lists of the publications of the station since its establishment and during the fiscal year, a brief statement concerning the principal lines of work, and a financial statement for the fiscal year ended June 30, 1911.

Annual report of the director for the fiscal year ending June 30, 1911 (*Delaware Sta. Bul. 94, pp. 10*).—This contains the organization list and the report of the director on the work of the station. It includes a financial statement for the fiscal year ended June 30, 1911.

NOTES.

California Station.—Work has been begun on a laboratory building at the Citrus substation at Riverside, for which a state appropriation is available. Dr. J. E. Coit has been appointed director of the laboratory.

Connecticut College.—Dr. A. F. Blakeslee has been granted a year's leave of absence for research work on the lower fungi at the Carnegie Station for Experimental Evolution.

Hawaii College.—During the winter and spring months the college conducted a short course for teachers, including 15 special lectures on Monday afternoons. The maximum attendance was 50, the average 25.

Illinois University and Station.—New professorships have been authorized in landscape art, animal pathology, and dairy husbandry, also an associate and an instructor in landscape art. B. S. Pickett, of the New Hampshire College and Station, has been appointed assistant professor of pomology, and J. J. Gardner, also of the New Hampshire College and Station, as instructor in pomology. Dr. John Detlefson, of the Bussey Institution, has been appointed assistant professor of a new division of genetics in the animal husbandry department, Dr. Walter E. Joseph instructor in animal husbandry, and V. A. Place assistant in animal husbandry. Dr. Otto Rahn, of the Michigan College and Station, has been appointed assistant professor of bacteriology.

Kansas Station.—According to a note in *Kansas Farmer*, A. M. Ten Eyck has resigned as superintendent of the Fort Hays substation.

Kentucky University and Station.—Dr. M. A. Scovell, director of the college of agriculture and director of the station since its establishment, died August 15 after an illness of two weeks. An account of his career will appear in a later issue.

Massachusetts Station.—B. G. Southwick, a 1912 graduate of the college, has been appointed secretary to the director, vice H. J. Baker, whose resignation has been previously noted.

Minnesota University.—Returns from a blank form sent to each alumnus of the school of agriculture who graduated previous to 1909 show that of the 385 men responding, 225 are farming at the present time and the remainder engaged in 34 occupations. Of the 119 women heard from, 60 are housekeepers, 34 teachers, and the balance engaged in 8 other occupations.

Nebraska Station.—John A. Ratcliff has been appointed assistant in experimental agronomy, and has entered upon his duties.

Nevada University and Station.—President J. E. Stubbs has been granted a year's leave of absence, during which time he will make a trip around the world. Dean Lewers will be acting president in his absence.

E. A. Howes, formerly with the seed branch of the Canadian Department of Agriculture, has been appointed professor of agronomy and agronomist. Dairy instruction is to be begun in the university, and V. E. Scott, formerly with the Dunn County Agricultural School of Menomonie, Wis., has been appointed instructor in dairying.

New Hampshire College.—President W. D. Gibbs has resigned to engage in business, retiring September 1.

Cornell University.—Plans are nearing completion for the forestry building, which is expected to be ready for occupancy in the fall of 1913. A three-story and attic brick structure, 142 by 54 feet, is contemplated. The ground floor will contain laboratories for wood technology and a timber-testing room, and the remaining floors will be devoted to offices, class rooms, laboratories for forest mensuration and utilization, silviculture, and dendrology, a museum, herbarium, drafting rooms, etc.

The New York State Grange has contributed $600 for 12 scholarships in the college of agriculture, which were recently awarded after a competitive examination held in each county to which members of the grange 17 years of age or over were eligible.

New York State Station.—Among recent changes are the resignation of Miss Minerva Collins as assistant botanist, and the following appointments: Walter O. Gloyer as associate botanist, Richard F. Keeler, Reginald C. Collison, and W. J. O'Brien as assistant chemists, Bentley B. Fulton as assistant entomologist, James R. Brew as assistant bacteriologist, and Mancel T. Munn as assistant botanist.

North Carolina College Station.—The extension department operated an agricultural train over the Atlantic Coast Line Railroad July 23 to August 8, in which live stock, drainage, and farm implements were the main features. A car of horses, cattle, and hogs, and a car of implements were taken from the college farm, and demonstrations in plowing and the laying of tile were given at each of the two stops made daily. The attendance during the trip was more than 10,000.

Dr. Burton J. Ray, assistant chemist, has accepted the professorship of chemistry in the Porto Rico College, where special attention is to be given to the development of courses in sugar chemistry.

Ohio State University.—Dr. H. A. Weber, professor of agricultural chemistry since 1884, died June 14, at the age of 67 years. Prof. Weber received his undergraduate education at Otterbein University and in Germany, and was given the degree of Ph. D. from Ohio State University in 1879. Among other offices which he held during his long career were those of assistant chemist in the Ohio Geological Survey from 1869 to 1874, professor of chemistry in the University of Illinois from 1874 to 1882, chemist to the Illinois state boards of agriculture and health during the same period, and chemist to the State Dairy and Food Commission of Ohio from 1884 to 1897. He was also a member for several years of the committee on food standards of the Association of Official Agricultural Chemists.

Together with the late Director M. A. Scovell, Dr. Weber worked on the production of sugar from sorghum in 1883, and also studied at an early date, among other questions, the needs of soils for fertilizers, light as a factor in sugar production, and the development of root tubercles in water cultures. He was the author of Select Courses in Qualitative Analysis, the first edition of which appeared in 1871, and had also contributed to various chemical publications.

Pennsylvania College and Station.—W. J. Wright has resigned as instructor in horticulture and horticulturist to accept the directorship of the New York State School of Agriculture at Alfred.

South Dakota College and Station.—The appointment is noted of H. E. Erdmann as assistant in dairying.

Tennessee University and Station.—According to a recent issue of the *Southern Agriculturist*, the Southern Railway, in conjunction with the Virginia & Southwestern Railway, the Cincinnati, New Orleans & Texas Pacific Railway, and the Mobile & Ohio Railroad, has established three agricultural scholarships

in the university of $300 a year for four years. The recipients must be from farms in a county traversed by the Southern Railway system, must be in need of financial assistance, and must agree to practice or teach agriculture for two years after graduation in territory contiguous to some line of the system.

At the suggestion of the station authorities the railroads have this summer been operating excursions from the various counties of east Tennessee to the station to give farmers an opportunity to become familiar with its work. These excursions have proved very successful.

Oscar Campbell has been appointed plat assistant at the West Tennessee substation, and G. L. Herrington has been appointed horticultural assistant.

Utah College.—L. A. Merrill, director of the extension division, has resigned to engage in commercial practice as an agricultural expert. The offices of the extension division were transferred from Salt Lake City to Logan September 1.

Virginia Truck Station.—P. T. Cole, assistant horticulturist, has resigned to become assistant agricultural commissioner to the St. Louis Southwestern Railway Company, with headquarters in St. Louis.

Agriculture at Syracuse University.—Announcement is made by the division of agriculture, established about a year ago in response to the demand "under which every progressive university is put to offer the opportunity for instruction in agriculture as part of a liberal and technical education," of courses in general agriculture, animal husbandry, dairying, horticulture, agricultural engineering, and a special course for teachers. F. W. Howe, formerly of this Office, is director of the division.

General Agricultural Committees of Bankers' Associations.—Over 200 delegates, representing the agricultural committees of the bankers' associations of 22 States, met at Minneapolis and St. Paul August 7 and 8 for a discussion of agricultural education and improvement. Among the speakers were Thomas P. Cooper, secretary of the North Dakota Farming Association. President A. M. Soule, of the Georgia College; J. J. Hill; A. V. Storm, of the University of Minnesota; and S. M. Jordan, manager of the Pettis County Bureau of Agriculture, of Sedalia, Mo., all of whom discussed various phases of extension work.

A silver trophy offered to the State committee making the largest contribution to agricultural education and improvement was awarded to that of North Dakota, where the committee reported financing the better farming association to the extent of $45,000, also contributing $5,000 for farmers' institutes in the absence of a State appropriation, and $5,000 for holding local corn-growing contests, in which over 11,000 men and boys participated. Joseph Chapman, jr., and Charles R. Forst, both of Minneapolis, were reelected president and secretary, respectively, for the ensuing year.

Illinois Country Life Conference.—A state conference on country life was held at De Kalb, Ill., August 1 and 2, which called together representatives of every type of rural organization and discussed all phases of country life. A most unique and helpful feature of this conference was a country life exhibt, to which many local and national organizations contributed. The conference was the second annual meeting of the Illinois Federation for Country Life Progress, a State-wide organization designed to unite all rural progress agencies of Illinois in one large, comprehensive campaign for the improvement of country life.

Second International Congress of Entomology.—This congress was held at Oxford August 5 to 9 under the presidency of Prof. E. B. Poulton and with representatives of about 20 countries in attendance.

In the section of economic entomology a paper was presented by Sir Daniel Morris, on behalf of H. A. Ballou, on Some Entomological Problems of the West Indies, with particular reference to insect control through the introduction of parasites. A. G. L. Rogers discussed the question of quarantine regulations, and his proposal of an international commission in connection with the International Institute of Agriculture met with the approval of the congress.

The next congress is to be held in Vienna in 1915, under the presidency of Prof. Anton Handlirsch.

International Association of Poultry Instructors and Investigators.—The first conference of this association took place in London July 18 to 24, with 27 countries represented. Lord Lucas, parliamentary secretary of the board of agriculture and fisheries, welcomed the delegates on the part of the British Government, and stated that the establishment of a national poultry institute for the scientific study of questions related to poultry husbandry and where instructors for the county work may be trained was receiving consideration.

A permanent organization was effected, E. Brown, of London, England, being chosen president, and Dr. Raymond Pearl, of the Maine Station, secretary.

A resolution was adopted providing for holding in 1914 a world's poultry congress, representing all sections of the industry. The association voted to institute fellowships to be conferred on such persons as shall have rendered service of the highest distinction to the advancement of the poultry industry. These fellowships are to be conferred by vote of the entire association, and are restricted in number to five every three years.

A central bureau of information is to be established, located for the present in London, and to contain an historical section, illustrative material, etc. The publication of a journal is also contemplated.

American Association of Instructors and Investigators in Poultry Husbandry.—At the fifth annual meeting of the International Association of Instructors and Investigators in Poultry Husbandry, in connection with the recent session of the Graduate School, a change of name to American Association of Instructors and Investigators in Poultry Husbandry was adopted. Horace Atwood, of the West Virginia University and Station, was elected president; J. C. Graham, of the Massachusetts College, and H. L. Kempster, of the University of Missouri, vice presidents; and Homer W. Jackson, of Buffalo, N. Y., secretary-treasurer.

Miscellaneous.—Charles H. T. Townsend has been appointed in charge of the Estación de Entomologia, which will comprise all government entomological work in Peru, and will have its headquarters at Lima. E. W. Rust, who has been associated with Mr. Townsend, is to remain at Puira in charge of a substation to combat cotton plagues.

M. A. Carleton, for the past 18 years in charge of the grain investigations of this department, has been given charge of the work of the Pennsylvania Chestnut Tree Blight Commission.

S. A. Bedford has succeeded J. J. Golden as deputy minister of agriculture for Manitoba.

Walter Morrison has made a third gift of $50,000 to Oxford University for the promotion of agricultural work.

King George V has conferred the honor of knighthood on Harry James Veitch for distinguished work in horticulture.

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EXPERIMENT STATION RECORD.

VOL. XXVII. OCTOBER, 1912. No. 5.

Record has already been made in these pages of the untimely death of Dr. M. A. Scovell, director of the Kentucky Experiment Station and head of the agricultural department of the State University. But the position of this man and the high esteem and affection in which he was held demand for him more than formal notice.

Melville Amasa Scovell was born at Broadway, N. J., February 26, 1855. At the time of his death, therefore, on August 15 last, he was in his fifty-eighth year. His apparent recovery from his sickness of a few years ago, and the general robustness and vigor which characterized him, gave him the appearance of being in the prime of life and seemed to promise many years of service. His taking away at a time when the results of so many years of labor were coming into fruition and the outlook for the future was so bright seemed especially to be regretted. But he lived to see his ambitions realized in an attitude of public appreciation for agricultural education and research in his State, permanent financial support for them, and an equipment for the experiment station equalled in few States. These were in an unusual measure the product of his own labors, and will remain a monument to his memory.

Dr. Scovell's collegiate work was done at the University of Illinois, then the State Industrial University, where he graduated in 1875 with the degree of B. S., specializing in chemistry. He remained with the university for seven years after graduation, being successively instructor in chemistry, assistant professor, and later professor of agricultural chemistry. He received the degree of M. S. from the university in 1877, and of Ph. D. in 1908. While at the university he gave considerable study to the production of sugar from sorghum, working out with the late Prof. H. A. Weber a method for obtaining sugar from this plant in quantities which at prevailing prices was thought profitable. In 1883 and 1884 he was superintendent of the Kansas Sugar Works at Sterling, Kans., and the following year was special agent for this Department in the erection of diffusion batteries for extracting sugar from sorghum and sugar cane in Kansas and Louisiana.

The Kentucky Agricultural Experiment Station was established in the summer of 1885 and Professor Scovell was elected as director, assuming his duties in November of that year. His continuous period of service as director for twenty-seven years is exceeded by only one case, that of Dr. E. W. Hilgard of California. It places the Kentucky Station in the unique position of having suffered no change in its administrative head since its establishment, a fact which is the more remarkable when the frequent change at most of these institutions in the early days is considered.

The beginning of the station was a meager one, and its resources were very limited. There were no special funds for its maintenance, and little in the way of facilities and equipment. One large room in the basement of the college building was assigned to the station, and this by subdivision was made to serve as office, chemical laboratory, and balance room. About twelve acres of land, all the tillable land the college then had, was assigned to the station for field experiments. The director was the only person whose time was devoted exclusively to the station work, and upon him devolved in large measure both the planning and the execution of the work.

In 1886 the legislature so modified the existing law relating to the sale of commercial fertilizers as to place the station in charge of the fertilizer control and give it the benefit of the fees. This was the first formal recognition of the station as a state institution. The following year a farm of about forty-eight acres was added, and a station building was provided in 1888. A second farm of sixty-four acres was acquired in 1898, to provide increased facilities for the field and feeding experiments, and subsequently other additions were made until the station fields assumed their present generous proportions.

To the fertilizer control was later added the state food control and the feeding stuff, nursery stock, and seed inspection, which provided a steadily increasing revenue. While these inspection duties made large demands upon the station, the work was so organized as not to interfere seriously with the experimental work, and new departments were added as the funds permitted. In 1905, the station having outgrown its quarters a new building, thoroughly modern and complete in all its appointments, was erected. This in time also became inadequate, and the past year an addition, larger than the original structure and costing about $50,000, was begun.

During these years much of the time and effort of Professor Scovell were occupied in securing and preparing for use the buildings and land which he felt were required for the proper equipment of the station. These were provided in very large measure out of the earnings of the station, without specific state appropriation. This called for a high order of executive ability and business management.

Although the revenue of the station in 1911 reached over $125,000, it was derived, except for the federal funds, from the earnings of the station in the laboratory and on the farm. By economy and good management Dr. Scovell had been able to save from these yearly earnings the funds needed for building up the physical equipment without calling on the State for aid.

He realized, however, that the State should make definite provision for the station, and one of the closing features of his career was securing from the legislature last winter a permanent appropriation of $50,000 per annum for the use of the station in its experimental work and to provide for extension teaching. This was a notable achievement, and showed the confidence and support he had won from the people of the State. It placed the station in excellent financial condition, which would have enabled him in future to have focused his attention on the further development of the station along research lines. This development he had already set in motion, and his plans would soon have made the Kentucky Station conspicuous in that field.

To this extent, then, Dr. Scovell's greatest work was perhaps as an able administrative officer, a builder of public sentiment, a provider of opportunity for the work of others. But with a keen insight into the needs of the agriculture of the State he instituted and conducted personally experiments covering a wide range of subjects, including the culture and fertilizing of staple crops, the growing and curing of tobacco, and the handling of dairy cattle; and he planned for and directed the activities of the members of his staff along many important lines of experiment and inquiry.

This staff, of which he was the principal working member at the outset, had reached over thirty in number at the close of his career, all of whom devoted practically their entire attention to the station's work. His position as the leader of this group is well expressed in the appreciative resolutions of his coworkers, which declare that "to all of us he was not only the inspiring, helpful director, doing all in his power to stimulate and encourage and support the various departments of the station and the agricultural college, but more than all else the gentle, kindly, sympathetic friend."

With the reorganization of the State University in 1910, Dr. Scovell was urged to assume the direction of the college of agriculture, a task which his deep interest in the upbuilding of agriculture induced him to undertake in addition to his other duties. The progress of the new college of agriculture in two years has been most gratifying, and has reflected credit upon his organizing and administrative skill. Provision for its permanent maintenance, like that of the experiment station, came as one of the closing efforts of his life, the legislature of last year voting the university an appropria-

tion of $50,000 per annum for maintenance, in which the college of agriculture is to share.

Dr. Scovell's activity was by no means confined to the duties of his own institution. He was an unusually public-spirited man, giving freely of his interest and his time to various local enterprises, and displaying a high order of ability in securing results. He was a leading spirit in the community, and one on whom much dependence was placed. In a national way he was prominently identified with the leading movements for agricultural advancement. From the time he came into the Association of American Agricultural Colleges and Experiment Stations in 1889 until the close of his life there was hardly a year when he did not serve the association in some capacity, either as an active officer or a member of one or more of its committees. He was a member of the executive committee from 1889 to 1895, and was secretary and treasurer from 1890 to 1894. He was president of the association in 1909, but was prevented by illness from presiding at the convention of that year.

His most conspicuous service was as chairman of a committee nominated by the association to supervise the tests of dairy cows at the World's Columbian Exposition, in 1893. This was one of the most remarkable breed tests ever conducted, being upon a scale and with a thoroughness never before approached. The management of the tests was practically in the hands of the committee, which developed methods and system, made a detailed record of the feed and of the performance of the individual cows, and computed the results. The records contained nearly three million separate entries of fact, and were deemed a very important contribution to the literature of dairying, but owing to the expense of their publication they were never printed in detail.

Much of the responsibility for the conduct of these tests with such thoroughness, fidelity, and skill naturally devolved upon the chairman of the committee, who was also called upon to handle many delicate matters in relations with the competing breeders and authorities. He gave to it much of his time and strength during a large part of the year, and the occasion was the beginning of the association of his name with dairy cattle in a national way. The success of the elaborate precautions adopted to secure absolute fairness and accuracy is attested by the fact that from no reputable source has the least doubt been cast upon the accuracy of the results.

Dr. Scovell's position as an expert in dairy cattle led him to be sought as manager of the Jersey herd at the St. Louis World's Fair test, and also to be offered the position of secretary of the American Jersey Cattle Club, both of which he declined. He was recently elected a director of the latter club. Less than two years ago he

rendered much assistance in establishing the Jersey herd of Elmendorf Farm, making a trip abroad for the purpose, and selecting high-priced animals in this country. He was also in demand as a judge at fairs. He loved dairy cattle, and his knowledge of them put him in the highest class of experts. The *Breeder's Gazette* says of him, "he was the best known and best liked judge of dairy cattle in America."

Dr. Scovell was also active for many years in the Association of Official Agricultural Chemists, in the development and improvement of methods of agricultural analysis. He was president of that association in 1909. He was for several years a member of the committee on food standards, which worked in cooperation with this Department after the passage of the Food and Drugs Act of 1906. He was a member of various learned societies, especially those relating to agriculture and to chemistry, and was a fellow of the American Association for the Advancement of Science.

Dr. Scovell's personal qualities deserve especially to be mentioned. Gentleness, kindness of heart, patience amounting almost to a fault, and a tolerance and sympathy which were never failing, were attributes which he embodied in remarkable degree. As his associates have well said, "in the highest and best sense he was the good citizen and the pioneer in the spread of a higher civilization and nobler ways of living." These high attributes of character, coupled with his unbounded good humor and cordiality, made him hosts of friends to whom he was joined by strong bonds of friendship.

The affection and esteem in which he was held in his home city is attested by the unusual action of the street railway company in ordering that at the hour of his funeral services every car should stop for three minutes, and of the mayor of Lexington in requesting that every wheel, on pleasure or business bent, should pay him the same mark of respect.

Truly, as President Barker of the university has said, "the world is richer because he has lived and poorer because he is dead."

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Physical chemistry and agriculture, C. ULPIANI (*Atti Soc. Ital. Prog. Sci. [Naples], 4 (1910), pp. 317–351, figs. 4; abs. in Chem. Ztg., 35 (1911), No. 103, Repert., p. 430*).—The importance of the phase rule, electrolytic dissociation, colloidal condition, etc., for explaining some of the phenomena which occur in the soil, as well as the action of certain fertilizers, is pointed out.

Agricultural chemistry, F. KLINKERFUES (*Monatsh. Landw., 4 (1911), No. 10, pp. 293–299*).—This is a discussion of some of the newer findings in the field of agricultural chemistry.

Phytin and phosphoric acid esters of inosit, R. J. ANDERSON (*New York State Sta. Tech. Bul. 19, pp. 3–16; Jour. Biol. Chem., 11 (1912), No. 5, pp. 471–488*).—Attempts to synthesize phytic acid and the hexaphosphoric-acid ester of inosit resulted negatively. The compound obtained with the Contardi method, or with a modification thereof, was the tetraphosphoric ester of inosit. It made very little difference whether the phosphoric acid was present in a small or large excess (above 6 molecules of phosphoric acid to 1 molecule of inosit), the same compound being produced. When present in a lesser amount than 6 molecules of acid to 1 of inosit a mixture of esters was obtained. The tetraphosphoric-acid ester of inosit, which is a new compound, could be easily isolated by means of its barium salt, and is very similar in appearance and in its behavior with reagents to phytic acid. When decomposed by heating with an acid, phosphoric acid and inosit were regenerated. The inosit used in the esterfications was prepared from a crude magnesium compound, which is mentioned below. Inosit was not so easily obtained as one is led to believe by the work of Starkenstein.

Several salts, tribarium phytate, $C_6H_{12}O_9[(PO_3H)_2Ba]_3$, pentabarium phytate, $C_6H_{14}O_{27}P_6Ba_5$, pentabarium ammonium phytate, $C_6H_{12}O_{27}P_6Ba_5(NH_4)_2$, pentamagnesium ammonium phytate, $C_6H_{12}O_{27}P_6Mg_5(NH_4)_2$, and tetracupric dicalcium phytate, $C_6H_{12}O_{27}P_6Cu_4Ca_2$, were prepared in some instances "from commercial phytin and from an organic-phosphorus magnesium compound by precipitating with barium chlorid and barium hydroxid; others were prepared from previously purified phytic acid." Those obtained from neutral or alkaline solutions have a general formula—$C_6H_{12}O_{27}P_6M_6$. "The barium salt of phytic acid, obtained from very dilute hydrochloric acid or 10 per cent phytic acid solutions corresponds to the general formula—$C_6H_{18}O_{27}P_6M_2$." The constitution of phytin therefore still remains unsolved.

Method for preparing tyrosin and glutaminic acid, and their quantitative determination, E. ABDERHALDEN (*Hoppe-Seyler's Ztschr. Physiol. Chem., 77 (1912), No. 1, pp. 75, 76*).—A quantitative method is described for preparing tyrosin and glutaminic acid, which allows the use of the mother liquors for isolating other amino acids which may be contained in them, as follows: The protein, i. e., waste silk, etc., is hydrolyzed by boiling for 6 hours with 3 times its bulk of fuming hydrochloric acid (specific gravity 1.19). The hydrolysate

is then evaporated repeatedly under diminished pressure to remove most of the hydrochloric acid, and the residue taken up with water. Ammonia gas is then passed through the solution until saturation has taken place, or if no ammonia bomb is at hand the residue is dissolved in an excess with ammonium hydroxid solution in water. The solution is then again evaporated to dryness, and if silk waste was employed the solution is extracted with cold water. Tyrosin remains in the residue. A still better way is to boil the residue with water containing some animal charcoal, the tyrosin being allowed to crystallize out from the extract. The mother liquors obtained are then evaporated to dryness and esterified in the usual manner. The undissolved ammonium chlorid may be filtered off, while the remainder of the process is the usual one.

For preparing the glutaminic acid ammonia gas is passed through the aqueous solutions and these evaporated to dryness. The residue is then recrystallized from hot water. The greater portion of the glutaminic acid can be obtained by fractional crystallization, and the remainder from the mother liquors by precipitation with alcohol.

The identity of the guanin pentosid prepared from molasses with reference to vernin, E. Schulze and G. Trier (*Hoppe-Seyler's Ztschr. Physiol. Chem., 76 (1912), No. 2–3, pp. 145–147; abs. in Zentbl. Biochem. u. Biophys., 12 (1912), No. 23, p. 901; Zentbl. Physiol., 26 (1912), No. 1, p. 9*).—The guanin pentosid obtained by Andrlík (E. S. R., 26, p. 116) from molasses residues is thought to be identical with the compound known as vernin. The authors believe that guanin-*d*-ribose is the only guanin pentosid occurring in nature.

The complete extraction of alcohol and water-soluble phosphorus compounds from plants, H. Ulrich (*Arch. Expt. Path. u. Pharmakol., 68 (1912), No. 3, pp. 171–185*).—The 3 principal groups of phosphatids can be extracted by treating the dried plant tissue, etc., 24 hours with absolute alcohol, being careful to exclude all extraneous moisture during the process. This is followed by extracting the material with dilute nitric acid (0.5 per cent) for about 20 successive times at room temperature. The work was done with oats and wheat bran.

The mode of action of phosphatese, I, H. Euler and S. Kullberg (*Hoppe-Seyler's Ztschr. Physiol. Chem., 74 (1911), No. 1, pp. 15–28*).—The enzym phosphatese (the authors propose using the termination "ese" for synthesizing enzyms), in the presence of phosphates during the fermentation of sucrose with yeast juice or with extract of dried yeast will bring about the formation of carbohydrate-phosphoric acid esters. The authors now find that this enzym is much more readily absorbed by kaolin than was invertase from a neutral solution, and is much more quickly destroyed by precipitating with alcohol. Phosphatese shows its greatest activity in alkaline solutions, and at 30° C. its activity is one and three-fourths times greater than at 20°, but it is much less resistant to heat than invertase. It was also noted that unaltered dextrose does not react, or only very slowly reacts with the phosphate.

An ester obtained by treating a partially fermented solution of dextrose or levulose with a phosphate was optically inactive, nor was an optically active product obtained when the ester was decomposed with an acid or alkali. The ester is in all probability produced from a substance which is formed and decomposed again during the action of yeast on dextrose. This holds good for levulose and sucrose also. *Aspergillus niger* (when cultivated in sucrose and yeast water) and ripe oats contain phosphatese. Two enzyms are apparently concerned in the above process, one which converts the sugar into an ester-forming carbohydrate, and another which synthesizes the ester from the phosphate and carbohydrate ions.

In regard to the action of phosphatese, H. Euler and S. Kullberg (*Hoppe-Seyler's Ztschr. Physiol. Chem., 76 (1912), No. 2-3, p. 241; abs. in Zentbl. Expt. Med., 1 (1912), No. 4, p. 153*).—The difference in results obtained by von Lebedew and the authors can be attributed to the kind of yeast preparation employed.

Regulatory formation of the enzym tannase, L. Knudson (*Abs. in Science, n. ser., 34 (1911), No. 868, pp. 219, 220*).—*Aspergillus niger* was grown in 14 media, each of which contained a different carbon compound. The results show that tannase formation takes place when the sugar in the medium is displaced by tannic or gallic acid, or supplemented by tannic acid. Gallic acid was found not to be as efficient as tannic acid as a source of carbon for stimulating the formation of the enzym.

As no work has been reported on the effect of concentration of the transformable substance on the quantity of the corresponding enzym produced, the author made tests with *A. niger* and *Penicillium* sp., "in which a modified Czapek's solution was the nutrient medium—in this the concentration of sugar was made 10 per cent, and it was supplemented by tannic acid in concentrations varying from 0.01 to 10 per cent. The quantity of the enzym produced was augmented by increase in concentration of the tannic acid. None, however, was formed when the concentration of tannic acid was as low as 0.01 per cent.

"Similar results were obtained with *Penicillium* sp., *A. candidus*, *A. oryzæ*, and *P. granulatum* cultivated in a synthetic solution in which the carbon was supplied as 5 per cent cane sugar and supplemented by 2 per cent tannic acid also developed in the enzym tannase. *P. expansum* in a similar solution did not develop the enzym."

Separation of peroxidase from catalase, A. Kasanski (*Biochem. Ztschr., 39 (1912), No. 1-2, pp. 64-72*).—This is a study of a method for obtaining preparations which will give the peroxidase reaction but not the catalase test. It is accomplished by adding pyrogallol to the material under examination. Hemp, sunflower, and barley seedlings, liver, radishes, horseradish, and yeast were studied.

Action of emulsin upon salicin in an alcoholic medium, E. Bourquelot and M. Bridel (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 15, pp. 944-946*).—The results show that the action of emulsin upon salicin is not arrested in solutions containing strong concentrations of alcohol.

The calcium carbid method for determining moisture, H. C. McNeil (*U. S. Dept. Agr., Bur. Chem. Circ. 97, pp. 8, fig. 1*).—This is a description of a method for determining moisture in paints, soaps, and miscellaneous materials by the calcium carbid method (E. S. R., 27, p. 312). Calcium carbid is added directly to a known weight of the sample, the amount of acetylene generated during the process measured, and the amount of acetylene found is then referred back to moisture.

The apparatus employed in the method is illustrated and consists of a generating flask of about 20 cc. capacity for holding a known weight of the material to be examined, and which has a carbid tube with a projection on one side for holding 5 cc. or more of a finely powdered carbid. The flask is attached to a 100 cc. jacketed burette, drawn out at the ends to facilitate connections. The jacket is connected with a tap for the purpose of cooling with water and to obtain an accurate control of the temperature. In addition there is a leveling vessel. The liquid used in the gas burette and leveling vessel is either mercury or a concentrated solution of sodium chlorid, which has stood in contact with acetylene until saturation has taken place. The latter solution is tinted with phenolphthalein and a little sodium hydroxid to facilitate reading.

The behavior of this method with soaps, paint materials, infant foods, leather powders, vanilla beans, lubricating oil, and flour is described in detail.

The Kjeldahl method, M. SIEGFRIED and O. WEIDENHAUPT (*Hoppe-Seyler's Ztschr. Physiol. Chem., 76 (1912), No. 2–3, pp. 238–240; abs. in Zentbl. Expt. Med., 1 (1912), No. 6, p. 242*).—Boiling should not be resorted to after potassium permanganate has been added to the solution. The author takes the flask from the burner or turns the burner out, adds permanganate, heats, and then adds permanganate again for a period of 3 minutes until the pink color remains permanently.

A practical method for reducing potassium platinic chlorid when determining potash as potassium platinic chlorid, A. FIECHTER (*Ztschr. Analyt. Chem., 50 (1911), No. 10, pp. 629–632*).—The process consists of adding some magnesium filings or chips in dilute hydrochloric acid to the potassium platinic chlorid, which has been previously washed with alcohol and dissolved in a little hot water. The process is completed in a few minutes if the mixture is heated on a wire gauze. Some comparative tests between the method and Neubauer's show a difference of only from 0.1 to 0.2 per cent.

The determination of potassium as potassium platinic chlorid, B. TRNKA (*Ztschr. Analyt. Chem., 51 (1912), No. 2, p. 103*).—A discussion in regard to priority of the method described by Fiechter above.

In regard to iron metabolism.—I, Method for the quantitative determination of small amounts of iron, F. JAHN (*Hoppe-Seyler's Ztschr. Physiol. Chem., 75 (1911), No. 4, pp. 308–338; abs. in Zentbl. Biochem. u. Biophys., 12 (1912), No. 21–22, p. 863*).—For determining iron in organic substances, especially in small amounts, the author utilizes the Knecht and Hibbert method, which rests on the following equation: $FeCl_3+TiCl_3=TiCl_4+FeCl_2$. The method gives results which differentiate amounts of 0.1 mg. of iron very definitely and allows the titration to be done in 15 minutes.

The substances required in the test are concentrated sulphuric acid and nitric acid of known iron content for ashing according to the Neumann method, a solution of potassium sulphocyanate, approximately 40 per cent strength, a 1/250-normal to 1/500-normal titanic trichlorid solution, which is preserved by pouring paraffin oil upon it, a ferric sulphate solution containing 1 mg. of iron per liter, and air-free water.

A modification of Marsh's apparatus for the detection of arsenic, L. COHEN (*Dept. Agr. N. S. Wales, Sci. Bul. 4, 1911, pp. 5, fig. 1*).—The following modification of Marsh's apparatus, as used by the author, is described:

"Impure hydrogen, generated from dilute sulphuric acid and ordinary granulated commercial zinc, is purified by passing through a neutral aqueous solution of silver nitrate, which combines with the AsH_3 with reduction to metallic silver. It then passes through a mixture of the suspected liquid with dilute sulphuric acid, in contact with a small quantity of pure arsenic-free zinc, or a bundle of magnesium wire (in which latter case the solution must contain only very little free acid, so as to avoid much heating), and carries over the small quantity of hydrogen thus produced, with the AsH_3 resulting from the reduction of any arsenic present in the suspected matter. The combined gases, after drying, are tested in the usual way."

The chemical composition of the clay obtained in the Schloesing-Grandeau method, E. BLANCK (*Jour. Landw., 60 (1912), No. 1, pp. 75–81*).—The results of examining the clays elutriated by the Schloesing-Grandeau method from 7 Silesian soils, taken chiefly in the vicinity of Breslau, Germany, are given. The conclusion is reached that the chemical composition of the clay varies markedly, but within certain limits, and furthermore that the chemical compo-

sition of these clays bears no relation to the chemical composition of kaolin, because much of it consists of quartz particles. The claim made for the uniformity of these products obtained by this method is, therefore, not justified.

In regard to a precipitin with which it is possible to differentiate boiled insoluble protein, W. A. SCHMIDT (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 13 (1912), No. 2, pp. 166–185*).—Blood serum heated for 30 minutes at a temperature of 70° C., then treated with dilute sodium hydrate, and heated for 15 to 20 minutes more in order to make it nonreacting to either native or heat precipitin, when injected into an animal will yield a serum which contains a heat-alkaline-protein precipitin. This serum will react with a serum which has been boiled for 3 hours and dissolved in a decinormal sodium hydrate solution. The serum is a positive test for differentiating insoluble proteins.

In regard to the utility of the ester method for detecting monoamino acids when polypeptids are present, E. ABDERHALDEN and R. HANSLIAN (*Hoppe-Seyler's Ztschr. Physiol. Chem., 77 (1912), No. 4, pp. 285–288*).—The method is deemed perfectly reliable for this purpose, providing the necessary precautions are taken.

A comparative study of some analytic methods for determining phosphorus in vegetable products, A. PONTE (*Staz. Sper. Agr. Ital., 44 (1191). No. 5–6, pp. 459–461*).—Comparing the results obtained for phosphorus when incinerating by the ordinary ashing and the electrical methods (E. S. R., 20, p. 207), it is noted that the former has losses which vary between 2 and 11 per cent. The methods which incinerate in the presence of calcium oxid yield figures about similar to those obtained with the electrical method.

The ash of vinegar, R. E. REMINGTON (*North Dakota Sta. Spec. Bul., 2 (1912), No. 5, pp. 92–94*).—In determining the phosphoric acid content of vinegar considerable difficulty was always experienced in obtaining duplicate results for the soluble and insoluble portion, although concordant results for total phosphoric acid were practically always obtained. In order to determine if the method of ashing used was accountable for these variations, 3 samples of cider vinegar were ashed in platinum dishes over Bunsen burners, which in each case were adjusted to give various degrees of heat. Some of the samples were finished with a blast lamp.

"While the temperature seems to exert little or no influence upon the total amount of phosphoric acid recovered, in all cases the soluble portion increases with increasing temperature. Expecting that higher temperature would favor the formation of more or less insoluble pyrophosphates, the results obtained are surprising. The alkalinity of the soluble ash increases with the temperature so long as it does not rise above the fusing point of the ash. But when the blast lamp was used, a decrease in alkalinity was noted, due to the loss of potassium salts by volatilization. That this is so was shown by ashing duplicate portions of vinegar, in one case blasting only long enough to obtain complete fusion, in the other for 30 minutes. . . . If the ash data are to continue of value in the interpretation of vinegar analysis, the ashing must be done under more carefully specified conditions than heretofore—say in an electric muffle, with accurate temperature control and for a definite time. Otherwise no two chemists can expect to obtain concordant results."

The Fiehe reaction for the examination of honey, L. STŒCKLIN (*Ann Falsif., 5 (1912), No. 41, pp. 116–121*).—This is a discussion of the reasons for some of the failures obtained with the Fiehe reaction, and a description of a procedure which will give better results.

The occurrence of boric acid in honey, G. BÜTTNER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 23 (1912), No. 4, pp. 139, 140*).—Pure honey often contains boric acid.

Detection of nitric acid in watered fruit juices, R. Cohn (*Ztschr. Öffentl. Chem., 17 (1911), No. 19, pp. 361–363; abs. in Analyst, 37 (1912), No. 430, p. 21*).—The method is as follows: Make 75 cc. of the juice alkaline with sodium hydroxid, evaporate nearly to dryness, and extract the residue with alcohol at a temperature of 40° C. The extraction is conducted for several minutes. If the residue from the alcohol extract still has a sirupy appearance it must be re-extracted with alcohol, and then taken up with 10 cc. of water and tested with diphenylamin for nitric acid. No positive reaction was ever obtained with authentic raspberry, currant, or cherry juices. Bilberry juice was found to give a blue coloration with sulphuric acid alone, and therefore can not be tested by this method. Nitron can be employed for this purpose.

Methods for sugar analysis and allied determinations, A. Given (*Philadelphia, 1912, pp. 75, figs. 8*).—This is a description of methods for examining sugar and sugar products. The official methods are included and some apparatus used in the Bureau of Chemistry of this Department is pictured.

Examination of lactose and the by-products of lactose manufacture, A. Burr and F. M. Berberich (*Chem. Ztg., 35 (1911), Nos. 82, pp. 751, 752; 86, pp. 794–796; 87, pp. 803, 804*).—Previously noted from another source (E. S. R., 26, p. 313).

The chemical and bacteriological methods for examining milk, G. Rühm (*Ztschr. Fleisch u. Milchhyg., 22 (1912); No. 5, pp. 142–148*).—This continuation of work previously noted (E. S. R., 25, p. 207) deals entirely with bacteriological methods. It includes some special methods for detecting and differentiating the organisms involved in mastitis, pyogenic infections, and actinomycosis.

What is the best test for judging the quality of milk? J. Stapenséa (*Tijdschr. Veeartsenijk., 39 (1912), No. 6, pp. 231–260*).—This is a study of the various methods proposed for examining milk from the hygienic point of view.

The catalase test is given first place for detecting milks which contain secretions from animals affected with mastitis. If a milk yields a volume of gas of 2 cc. or more within 3 hours, at a temperature of 37° C.±, the sample should be tested by the Trommsdorff leucocyte method and its chlorin content determined. When necessary other tests, such as Schardinger's reaction and the diastase test, may be employed in addition. The relation of the bacterial content of the milk to these reactions is also considered.

Methods for determining iron in milk, F. E. Nottbohm and W. Weisswange (*Ztschr. Untersuch. Nahr. u. Genussmtl., 23 (1912), No. 10, pp. 514–523*).—This work, which was done in part with synthetic ash solutions, confirms the findings of others that the iron content of milk can not be determined in a hydrochloric solution of the milk ash by the colorimetric method.

On the basis of the results obtained the authors recommend the following method for determining the iron content of milk: One hundred cc. of milk is dried in 2 platinum dishes on the water bath, heated to from 150 to 180° C., and ashed in a quartz muffle. The process is then completed over a microburner. In order to remove the last traces of carbon the ash is rubbed up with water, dried, and ashed again. The white ash is now mixed with iron-free hydrochloric acid and evaporated to dryness, and this process is repeated. The ash is then taken up with 40 cc. of ½-normal hydrochloric acid solution, transferred to an Erlenmeyer flask and oxidized by the addition of a few drops of nitric acid.

After cooling the ash solution it is transferred to a separatory funnel, 2 cc. of a 5 per cent solution of "cupferron" added, mixed well, and allowed to stand for ¼ hour. The solution is shaken out twice with 25 cc. of chloroform, the chloroform extracts are transferred to a 100 cc. Erlenmeyer-Jena flask, and the chloroform distilled off on a water bath, care being taken to distill off the last

traces of chloroform. The residue is ashed by carefully heating the flask over a free flame. The iron oxid obtained is dissolved in hydrochloric acid and determined colorimetrically with potassium sulphocyanate.

The iron content of cow's milk, F. Edelstein and F. von Csonka (*Biochem. Ztschr., 38 (1912), No. 1–2, pp. 14–22*).—Cow's milk collected in glass vessels was found to contain from 0.4 to 0.7 mg. of iron per liter, with an average of 0.5 mg. In ordinary mixed dairy or market milk the amount was somewhat higher, varying from 0.7 to 0.15 mg. The amount of iron in milk depends very much on the methods of handling it in the dairy and subsequently, and this may explain the great discrepancies in regard to the iron content of milk noted in the literature. Woman's milk contains about one-third to one-fourth more iron.

The Neumann iodometric method and the Lachs-Friedenthal method (E. S. R., 26, p. 314) were employed in this work. Certain disadvantages of the latter method are pointed out.

Notes on the analysis of margarin, C. H. Cribb and P. A. E. Richards (*Analyst, 36 (1911), No. 424, pp. 327–333*).—The simple Reichert-Wollny refractometer test, according to these authors, is no longer effective for determining whether margarin comes up to the legal standard, particularly where coconut oil and butter are present. A combination of the Wollny process and the Polenske method is suggested for the examination of butter, margarin, etc.

The authors propose a correction of the volatile fatty acids to include those due to coconut oil and for the solubility of so-called insoluble fatty acids. Experiments are reported with mixtures of coconut oil, butter fat, and margarin fat to illustrate some of the contentions noted above.

Time required to sterilize canned goods at different temperatures, H. Serger (*Konserv. Ztg., 13 (1912), No. 12, pp. 89, 90; Pure Products, 8 (1912), No. 5, pp. 257–260*).—From figures obtained in experimental tests the author proposes to subtract 60 minutes from the time required to sterilize the material in an open water bath and to divide the remainder by 3, the result obtained approximating the actual time required in heating in a retort. Conversely, the time actually required in a retort may be multiplied by 3 and 60 minutes added to obtain the time required in an open water bath. Carrots and snap beans were computed to need 16.6 and 20 minutes, respectively, in a retort, and Brussels sprouts, asparagus, and peas 183, 87, and 108 minutes in an open water bath.

"These figures are naturally not strictly exact, but are approximately correct, and will be the maximum times required, since we are considering the case of *Bacillus subtilis*, which is the most resistant of bacteria. Those who contemplate changing from the open water baths to retorts, or vice versa, will find this method of calculation of use."

The preparation of berry and other fruit wines, P. Arauner (*Naturw. Wchnschr., 27 (1912), No. 19, pp. 301, 302*).—The preparation of apple, gooseberry, strawberry, blackberry, currant, raspberry, blueberry, pear, cherry, and plum wine with pure culture yeast is described.

The milling of cane considered in relation to the volume occupied by the fiber, N. Deerr (*Hawaiian Sugar Planters' Sta., Agr. and Chem. Bul. 38, pp. 61, figs. 24*).—According to the author, no experiments are on record which show how cane fiber behaves under pressure. It was thought that if this topic were studied some data might be obtained in regard to the weight of the juice expressed and the volume of the fiber corresponding to a definite pressure.

"The amount of juice expressed from chopped cane subjected to a direct pressure increases with the degree of fineness of the material. After chopped cane has been pressed to a certain pressure a further notable quantity of juice can be obtained by releasing the residue from pressure and pressing again. The pressure at which juice begins to flow from bagasse is not a measure of the

pressure at which it has been pressed. With the pressure remaining constant greater percentages of juice are obtained from chopped cane as the quantity of material under pressure decreases. . . . At pressures up to 60 lbs. per square inch the volume of bagasse varies inversely as the 2.5th root of the pressure."

The work shows that "the pressure exerted by the bagasse in its passage between the top and front roller is very much less—probably about one-fortieth—than that exerted in its passage between the top and back roller, that is to say, the strains in the conventional 3-roller mill are symmetrical and as much metal is used in the feed side and in the front roller as in the delivery side and in the back roller. The logical application of the experiments described here would indicate that the front roller be regarded solely as a feed roller and would point to a 2-roller mill with a small feed roller as being the rational design for the later mills of a train.

"In a 2-roller mill, however, the pressure exerted by the layer of bagasse will not be in a vertical line but . . . will pass through a point 0.81 in. from the line of nearest approach of the rollers; in a mill with rollers superimposed vertically there will then be a small side thrust, due to the slow recovery of bagasse after compression."

Stohmann's handbook of sugar manufacture, revised by A. SCHANDER (*Stohmann's Handbuch der Zuckerfabrikation. Berlin, 1912, 5. ed. rev., pp. XVIII+810, pl. 1, figs. 384*).—A fifth edition of this well known work.

Centenary of the manufacture of beet sugar, 1812–1912, L. LINDET (*Bul. Assoc. Chim. Sucr. et Distill., 29 (1912), No. 9, pp. 600–619*).—This is a detailed historical discussion of the numerous events which occurred in the beet-sugar refining industry during the years 1812–1912.

Thirty-fourth report of the Swiss Agricultural-Chemical Institute at Zurich, 1911 (*Landw. Jahrb. Schweiz, 26 (1912), No. 3, pp. 167–182*).—This report contains analyses of fertilizers, feed stuffs, agricultural products, and miscellaneous substances.

METEOROLOGY—WATER.

Weather and agriculture, A. SCHMAUSS (*Landw. Hefte, 1912, No. 7, pp. 36, figs. 7*).—The farmer as a weather observer and prognosticator, the signs and methods he makes use of, and means of improving his methods by use of the weather maps and application of scientific principles, are discussed. Predictions based on phases of the moon as well as on the 100-year calendar of Mauritius Knauer and many popular rules are shown to be of no value. Lists of books suitable for the German farmer's use and of weather service stations in Germany are given.

Monthly Weather Review (*Mo. Weather Rev., 40 (1912), Nos. 3, pp. 321–486, pls. 10; 4, pp. 487–658, pls. 10, figs. 3*).—In addition to the usual climatological summaries, lake levels, weather forecasts and warnings for March and April, 1912, notes on the application of upper-air observations to weather forecasting, March and April, 1912, river and flood observations, lists of additions to the Weather Bureau library and of recent papers bearing on meteorology, a condensed climatological summary, and climatological tables and charts, these numbers contain the following special papers:

No. 3.—Some Effects of Air Drainage in River Valleys, by J. R. Weeks; The Bremo Bluff Tornado of February 21, 1912, by J. H. Kimball; The Floods of March, 1912, in the South Atlantic and East Gulf States, by C. F. von Herrmann; Ice Storm in Illinois, by C. J. Root; Abnormal Snowfall at Springfield, Mo., by J. S. Hazen; Temperatures Injurious to Peaches, Apples, and Pears in Various Stages of Development (see page 439); Depth of Snow in the

Mountains of Utah at the Close of March, 1912, by A. H. Thiessen; Report of Snow Measurements in Maple Creek Watershed, Utah County, Utah, March 4 to March 14, 1912, by A. H. Thiessen; Notes on the Rivers of the Sacramento and San Joaquin Watersheds during March, 1912, by N. R. Taylor; Notes on the Streams of the Upper San Joaquin Watershed, by W. E. Bonnett; Weather Conditions at Los Angeles, Cal., by A. B. Wollaber; and The Severe Cold of December 25–26, 1911, in the Citrus Districts of Southern California, and Methods Adopted for Fruit Protection, by A. B. Wollaber.

No. 4.—Destructive [Wind] Storm of April 2, 1912; The Floods of April, 1912, in the Gulf States; Floods in Michigan, Spring of 1912, by C. F. Schneider; Tornadic Storms in Illinois, by C. J. Root; Tornado at Murphysboro and Bush, Ill., April 21, 1912, by F. H. Colyer; Tornado Near Carbondale, Ill., by F. H. Colyer; City and Suburban Temperatures, by E. D. Coberly; Does Frost Fighting Pay in Utah? by J. C. Alter; Why the Snow Slides from the Mountain Slopes, by J. C. Alter; Measurement of Snow in Big Cottonwood Canyon, Utah (illus.), by S. Q. Cannon; Notes on the Rivers of the Sacramento and San Joaquin Valleys for April, 1912, by N. R. Taylor; Notes on the Streams of the Upper San Joaquin Watershed, by W. E. Bonnett; New Heater and Vaporizer for Frost Protection, by A. G. McAdie (see page 439); Lower Powder Valley Project, Baker County, Oreg., by J. H. Lewis; Reorganization of Government Meteorological Work in Chile; and A Peculiar Stroke of Lightning (illus.), by N. N. Mason.

General weather review, 1910–11, W. M. Esten and C. J. Mason (*Connecticut Storrs Sta. Rpt. 1910–11, pp. 579–597, figs. 2*).—A record is given of observations on temperature and precipitation during each month of 1910 and 1911 at Storrs, the rainfall for 1910 and 1911, the monthly mean temperature and monthly precipitation for the 23 years, 1888 to 1910, and dates of the last and first killing frosts for the 24 years, 1888 to 1911. The mean temperature at Storrs during the 24 years has been 47.1° F., the highest 99°, and the lowest —14°. The mean annual rainfall has been 45.35 in., the longest growing season 184 days, and the shortest 131, the average date of the last killing frost in the spring, May 4, and of the first killing frost in the autumn October 8.

Meteorological observations (*Maine Sta. Bul. 197, pp. 329–331*).—Observations at Orono, Me., on temperature, precipitation, cloudiness, and wind during 1911 are compared with the means of similar observations for 43 years. The mean temperature for 1911 was 43.62° F., the mean for 43 years 42.39°; the precipitation for 1911 was 36.06 in., for 43 years 43.30 in.; the snowfall for 1911, 76.25 in., for 43 years 91.11 in.; the number of clear days in 1911 was 113, cloudy days 133; total movement of wind in miles, 54,526. A table is also given which shows the monthly and annual precipitation during 1911 at 18 different places in Maine.

Report of the meteorologist, F. Stockton (*New Mexico Sta. Rpt. 1911, pp 50–55*).—Summaries of observations at the station from 1905 to 1911 on temperature, precipitation, and dates of first and last killing frosts, and from 1906 to 1911 on storms and wind movement are given.

[Meteorology of Finland] (*Fennia; Bul. Soc. Géogr. Finlande, 30 (1911), pts. 1, Cartes 16–19, pp. 62, figs. 3; 3, Cartes 16–19*).—The meteorological and climatological conditions of Finland are shown in a series of charts which are briefly discussed. A bibliography of the more important literature on the subject is given.

"Red rain" dust, T. Steel (*Chem. News, 105 (1912), No. 2742, p. 282*).—An analysis of dust which fell in Sidney October 11, 1909, is reported, indicating the material to be mainly sand and clay with 0.22 per cent phosphoric acid

and 0.17 per cent nitrogen. Potash was not determined. Other papers on the subject are reviewed.

Predicting water supply for the farmer, J. C. ALTER (*Sci. Amer. Sup., 73 (1912), No. 1904, pp. 413, 414, figs. 5*).—A brief account is given of a snow survey of the Maple Creek watershed near Springfield, Utah, by the Weather Bureau of this Department.

"The actual work of the snow survey consisted in going up the bottom of each gulch or canyon and back and forth along the slopes, measuring the snow depth and density every thousand feet or so, depending upon the variability of the snow deposit, the general topography, and the brush or forest cover, and mapping the snow area on a field map. . . .

"Stream flow measurements at a weir, located some distance above the highest farm land, have been made daily since the completion of the survey, and will be continued throughout this year (1912) and probably indefinitely in the future. Rain and snowfall observations have also been made from a precipitation gage located near the weir, and are to be continued indefinitely.

"The first year's records of run-off, following the survey, are not directly comparable with the amount of water in the form of snow, shown by the survey, even when corrected for precipitation gain, and evaporation loss, as there is a seepage loss in this particular canyon, the amount of which can not be determined from one year's observations."

SOILS—FERTILIZERS.

Investigations on soils from crystalline rocks in process of weathering, K. BUSCH (*Untersuchungen über Verwitterungsböden kristallinischer Gesteine. Inaug. Diss., Univ. Halle, 1911, pp. 67; Kühn Arch., 1 (1911), pt. 2, pp. 357–389, fig. 1; abs. in Zentbl. Agr. Chem., 41 (1912), No. 3, pp. 145–147*).—It is pointed out that previous investigations on soil particles, such as those by Ramann, Keilhack, Meyer, Sachse, Borzuchowski, and Puchner, have had to do with soil material of a heterogeneous character. In his work, therefore, the author used soils derived from known sources, that is, those formed in place from diabase, granite, and basalt rocks. With them he studied (1) the relation between the mechanical composition as determined by Hilgard's elutriator method and the hygroscopicity of the soil by the Mitscherlich method (E. S. R., 24, p. 419), and (2) the proportion of plant-food constituents contained in the different sized groups of soil particles. The surface soil derived from the diabase rock was a porous, fertile loam with a very porous, slightly sandy subsoil. The granite soil was a shallow, sandy loam with a rocky subsoil, and the basalt soil was a deep, heavy loam.

It was found that the individual soil particles of the different groups as separated out by sedimentation were not of the same size. This the author attributes to a difference in the surface area of the particles and a consequent variation in the resistance to the current of water. The variation in results of repeated mechanical analyses of the same soil is attributed to errors in sampling. Contrary to the conclusions of Mitscherlich, the hygroscopicity of these soils was not found to be proportional to the outer surface area. This may be explained by the fact that the larger soil particles contained hygroscopic water in the weathered cracks and crevices. Soils of the same mechanical composition differed in their hygroscopicity, this difference being determined by the mineral composition and the stage of weathering of the soil.

A relation between the size of the soil particles and the plant-food constituents was determined only for the iron and the calcium and magnesium carbonates. The iron was associated mostly with the finest particles. The dis-

tribution of the calcium and magnesium carbonates in these soils was similar to that in soils derived from marls, that is, the percentage of these constituents was higher for the finer particles and decreased in the sand components of the soil. There was no relation between the total lime, magnesia, phosphoric acid, potash, and nitrogen contents and the size of the soil particles. The amount of these constituents in the individual groups of soil particles was found to be dependent entirely upon the mineral composition of the soil particles which go to make up the individual groups.

It was also found that the solubility of phosphoric acid, calcium, and magnesium of the diabase subsoil in hydrochloric acid was greater than that of the surface soil. This was thought to be due to the more advanced weathering of the subsoil.

Gray sand and hardpan (Ortstein), Wilhelm Graf zu Leiningen (*Abhandl. Naturhist. Gesell. Nürnberg, 19 (1911), No. 1, pp. V+45, fig. 1; abs. in Internat. Mitt. Bodenk., 1 (1912), No. 6, pp. 584, 585*).—This report contains a review of the literature and an account of the author's own contributions to the subject. It is shown that hardness of hardpan is not dependent upon the iron compounds it contains but seems to be closely related to the moisture content of the soil. The aeration of the soil also seems to prevent the extreme hardening of the hardpan formation.

It is held that no one theory regarding the formation of hardpan has general application since the conditions of formation vary with the locality, especially with the kinds of vegetation and climatic conditions. Ortstein is rich in alumina and phosphoric acid and poor in lime, magnesia, and potash. Diluvial gray sand is, as a rule, poor in plant-food constituents. It may, however, be more fertile when the soil is formed in place. As a rule, the absorptive capacity of gray sand is low. Ortstein is not associated with any definite formation, although it generally occurs in fertile, loose sands and also on granites and buntersandstein. It is seldom formed in lime and gneiss soils. The age of ortstein has been determined in one case to be over 2,000 years.

Regarding brown soils, K. D. Glinka (*Pochvovĕdĕnie (Pédologie), 13 (1911), No. 1, pp. 17–48; abs. in Internat. Mitt. Bodenk., 1 (1912), No. 6, pp. 578–580*).—The author reports a study of typical formations of the so-called brown soils of central Europe as compared with similar formations (podzol soils) in Russia. It is stated that these brown soils are in a less advanced state of "podzolization" (chemical leaching processes under the influence of the solvent action of humus acids) than those of Russia, which are not of a typical brown type.

A geological sketch showing the distribution of the brown soils in Europe and in Asia is included.

Unproductive black soils, S. D. Conner and J. B. Abbott (*Indiana Sta. Bul. 157, pp. 235–264, figs. 5*).—It is stated that Indiana contains, principally in the northwestern counties, several hundred thousand acres of black or peat soils which are more or less unproductive but capable of being made fertile and productive by drainage and fertilization. Cooperative experiments were, therefore, undertaken on this soil in different counties to test the value of various fertilizer materials and mixtures for its improvement. Chemical analyses of samples of the soil are also reported.

The results showed that these soils were more often deficient in potash than in any other element and that applications of potash gave decided profit. "Some black soils of Indiana are more or less acid. Where there is strong acidity some form of basic lime, such as pulverized limestone, should be applied. On acid soils phosphoric acid is almost always needed in addition to limestone.

Potash is usually a secondary need on such soils." All the soils were well supplied with organic matter and only in a few cases was nitrogen necessary.

The soils of Alabama and their adaptations to crops, J. F. DUGGAR (In *Alabama's New Era. Montgomery: State Immigr. Dept. [1911], pp. 39–47, pl. 1*).—This is a general description of the physiographic divisions of Alabama and their characteristic soils and crop adaptations.

"Taking the State of Alabama as a whole, it may be said that sandy soils cover a larger area than do either clay loams or clays and that the largest areas of clay soils are in the central prairie regions and in the Appalachian Valley and Piedmont Region, in the eastern part of the State. The greater part of the surface of Alabama is slightly rolling, but there are broken or mountainous areas as well as comparatively level land. The largest areas of nearly level land are (1) in the southern edge of the Coastal Plain, that is, in the quarter of the State nearest to the Gulf; (2) in the Central Prairie Region and adjacent narrow regions on each side of it; and (3) in the Tennessee Valley. By far the greater proportion of the cultivated land of Alabama is free from stones, but the presence of stones, especially in the Piedmont Region, in the region of gravelly hills, and elsewhere, does not decrease productiveness, though the stones interfere with the convenience of cultivation."

[Analyses of soils of the Burirhat Station Farm] (*Ann. Rpt. Agr. Stas. East Bengal and Assam, 1911, pp. 25–28, pl. 1*).—Chemical analyses of samples of soil from fertile and from barren areas on this farm showed very little difference in composition except that the calcium carbonate content in the samples of fertile soil was about twice that in the samples of barren soil. The ratio of magnesia to lime was high in both cases, being generally in the proportion of 3 or 4 to 1. Experiments to determine the effect of liming the soil for its improvement are now in progress.

Weeds in relation to soils, WINIFRED E. BRENCHLEY (*Jour. Bd. Agr. [London], 19 (1912), No. 1, pp. 20–26*).—These studies have been previously noted (E. S. R., 27, p. 29).

The chemical characterization of soils, E. J. RUSSELL (*Chem. World, 1 (1912), No. 1, pp. 5–8, figs. 3*).—From a consideration of factors which influence the availability of plant-food constituents of the soil the author concludes "that for a complete account of the fertility relationships of soils a chemical examination alone is not likely to lead to any useful result." It is shown that soils of identical composition as determined by ordinary methods of soil analysis vary widely in productiveness as a result of difference in water conditions, suitability of the organc matter to support active bacterial life, and various other factors. Ordinary analysis must therefore be supplemented by various other inquiries before advice regarding improvement of a soil can safely be given.

More recent investigations in soil science, ALBERT (*Ztschr. Forst. u. Jagdw., 44 (1912), No. 4, pp. 240–249*).—The author reviews the development of studies in colloid chemistry, pointing out particularly the application of this subject to the study of the soil. He is of the opinion that the colloid theory is often used to explain hitherto unsolved problems of physics and chemistry without exact knowledge of the scientific basis upon which it rests. There is need of a more careful and extended study of the subject.

A short bibliography is added.

Colloid chemistry studies on humus in limed and unlimed soils, W. THAER (*Jour. Landw., 60 (1912), No. 1, pp. 1–18; abs. in Chem. Abs., 6 (1912), No. 13, p. 1797*).—This is an extract from a dissertation which has already been noted (E. S. R., 25, p. 823). Preliminary studies of the chemical composition and

other properties of products obtained by extracting limed and unlimed compost with water, precipitating with alcohol, and dialyzing the products are reported.

The concentration of phosphoric acid in the soil in the neighborhood of old centers of population, F. Hughes and A. Aladjem (*Agr. Jour. Egypt, 1 (1912), No. 2, pp. 81–83*).—Analyses of soil samples from the "Kom" of Sakha showed a much higher phosphoric acid content than the soils of the Delta of Egypt as a whole. It is stated that this "Kom" marks the site of one of the oldest cities of the Delta, and that the accumulation of phosphoric acid is a "clear case of valuable plant food being drawn from a large area and becoming concentrated in the course of time over an area much smaller and more circumscribed."

The quantities of radium and thorium emanations contained in the air of certain soils, J. Satterly (*Proc. Cambridge Phil. Soc., 16 (1912), No. 6, pp. 514–533, figs. 5*).—Measurements of radium and thorium emanations in the air of different soils to depths of 106 and 152 cm. showed at depths of from 100 to 150 cm. in gravelly soil about 2,000 times as much as there is usually in the atmospheric air.

The production and movement of nitric nitrogen in soils, R. Stewart and J. E. Greaves (*Centbl. Bakt. [etc.], 2. Abt., 34 (1912), No. 4–7, pp. 115–147, fig. 1*).—This article embodies the results of investigations previously reported in Bulletins 106 and 114 of the Utah Station (E. S. R., 22, p. 617; 26, p. 616), as well as of later investigations by improved methods on a new series of plats on the same soil. These investigations dealt with the amount and distribution of nitric nitrogen in the soil to a depth of 10 ft. as affected more particularly by water conditions and crop.

The results obtained indicated a pronounced variation in nitric nitrogen content of the soil from foot to foot during the season due to movement by water, variation in nitrification, feeding of the plant, and fixation of nitric nitrogen in the form of insoluble protein by micro-organisms. The application of irrigation water had a distinct beneficial effect upon the formation of nitric nitrogen, being greatest where 15 in. of water was applied.

In cropped land there was always less nitrogen in the soil during the fall than in the spring. In fallow soil, on the other hand, more nitrogen was found in the fall than in the spring, but this surplus largely disappeared during the winter months.

The amount of nitric nitrogen in alfalfa and oat soils was low. In corn and potato soils it was high. Alfalfa was found to be a heavier feeder on soil nitrogen than potatoes notwithstanding the fact that the alfalfa was abundantly supplied with root tubercles. The concentration of the soil solution was very low in alfalfa and oat soils and high in fallow, potato, and corn soils. The concentration of the solution was always higher in fallow soil than in alfalfa, oat, and corn soil, and nearly always greater in unirrigated than in irrigated soil. It varied, however, quite widely not only with the crop grown and the amount of water applied but also at different depths in the soil. There was always a larger amount of nitric nitrogen in the fallow plats than in the cropped plats, but when the amount of nitrogen removed in the crop was taken into account it was found that more nitric nitrogen had always been formed in the cropped soil. The amount of nitric nitrogen was found to be more constant in the uncropped plats than in the cropped plats. The proportion of nitric nitrogen was found to be comparatively constant in the lower foot sections of the soil irrespective of the amount of water applied, up to 25 in., indicating that there was little leaching of the nitric nitrogen beyond the lower depths of sampling.

Nitrates in soils, F. L. STEVENS (*Science, n. ser., 35 (1912), No. 913, pp. 996–1000*).—An abstract of this paper has already been noted (E. S. R., 26, p. 723).

The influence of molasses on nitrification in cane soils, S. S. PECK (*Hawaiian Sugar Planters' Sta., Agr. and Chem. Bul. 39, pp. 5–25, charts 8*).—In continuation of previous experiments on this subject with solutions and small quantities of soil (E. S. R., 24, p. 224), observations were made on 24 lysimeters, previously described (E. S. R., 25, p. 824), filled with surface soil from the station field.

Four lysimeters received no nitrogen and 4 each received sodium nitrate, ammonium sulphate, and high-grade tankage in amounts furnishing 100 lbs. of nitrogen per acre. Eight received the same amount of nitrogen in form of a mixture of equal parts of the 3 fertilizing materials named. One series of lysimeters was irrigated with water alone, one with water containing the equivalent of the ash content of 40 gal. of molasses per acre-foot of 3,000,000 lbs.; one series received molasses at the rate of 40 gal. per acre-foot before each irrigation; and one series received molasses at the rate of 400 gal. per acre-foot 1 week before the first irrigation. The molasses used contained nitrogen 0.27 per cent, lime 0.84, magnesia 0.99, potash 5.68, phosphoric acid 0.18, sulphuric acid 1.58, and chlorin 3.66 per cent. For the purpose of these experiments the ash was assumed to be composed of potassium chlorid 7.69, potassium sulphate 1.53, magnesium sulphate 1.32, and calcium phosphate 0.40 per cent.

A study of the drainage water from the lysimeters gave results confirming the conclusions from the previous experiments, indicating that "molasses applied to land which is receiving the usual fertilizer applications as practiced in [Hawaii] will work harm by causing a part of the nitrogen applied as nitrate to revert back to less available or unavailable forms of nitrogen; by checking the nitrification of sulphate of ammonia dressings, and by retarding the ammonification and nitrification of the nitrogen of organic fertilizers. The harmful effect of molasses dressings is due entirely to the organic constituents of the molasses, the mineral matters having no influence. Dressing with carbonate of calcium does not correct such adverse action of molasses."

Bacteriological studies of the fixation of nitrogen in certain Colorado soils, W. G. SACKETT (*Centbl. Bakt. [etc.], 2. Abt., 34 (1912), No. 4–7, pp. 81–115, figs. 5*).—This is substantially a reprint in the German language of Bulletin 179 of the Colorado Experiment Station (E. S. R., 25, p. 815).

Regarding legume cultivation and inoculation experiments, A. EICHINGER (*Pflanzer, 8 (1912), No. 4, pp. 190–219*).—Experiments were made to determine the value under Amani (German East Africa) conditions of inoculating soils (with nitrobacterine) with and without fertilizers for the growth of *Desmodium tortuosum*, *Canavalia ensiformis*, soy beans, and cowpeas, and the value of these crops for green manuring purposes.

The best results were obtained by soaking the seeds before inoculating. The heavier classes of soil were not benefited by inoculation. Applications of superphosphate increased the number of nodules formed, whereas with sodium nitrate no nodules were formed.

The tests with different crops were for the most part inconclusive, and are being continued. The work with the soy bean, however, seemed to indicate that the production of this crop is not profitable for this region.

Regarding a new method of soil aeration in its scientific and practical aspects (*Deut. Landw. Presse, 39 (1912), Nos. 41, pp. 483–485; 42, pp. 493–498*).—This article is divided into three parts, as follows: (1) A description of the method and its development, by M. Friedersdorff; (2) observations on the effect on the soil of the above method of aeration, by P. Holdefleiss; and (3) a

theoretical discussion of the importance of soil aeration for bacteria and plant culture, by B. Heinze.

It is stated that, after several years' observations, the conclusion was reached that the most important factor concerned in the increased productivity of a soil from tile draining is the improvement in aeration. In order, therefore, to bring about more perfect aeration he conceived the idea of connecting the tiles with the atmosphere by means of flues or pipes, which constitutes the method here described. It is maintained that such a system, which entails very little additional expense beyond that of the original cost of tiling, brings about a complete circulation of the air not only in the tiles but also in the soil and, furthermore, that the temperature and humidity of the soil and of the atmosphere tend to equalize as a result, thus having a most important bearing on the productivity of the soil.

Determinations were made from time to time of the organic matter content and oxidizing power of soils aerated in this manner as compared with soils not aerated. The results, although indicating greater bacterial activity in the aerated soil, are as yet inconclusive. The experiments are being continued.

On the penetration of soluble fertilizers into the soil, A. Demolon and G. Brouet (*Ann. Sci. Agron., 3. ser., 6 (1911), II, No. 6, pp. 401–418, figs. 2; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 4, pp. 897–899*).—The investigations reported in this article have already been noted from a briefer report (E. S. R., 25, p. 120).

The chemical composition of farmyard manure as a measure of its value, C. Crowther and A. G. Ruston (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 24 (1912), pp. 219–236*).—This article is based upon a study of the manure obtained in 2 steer feeding experiments, the object of which was "to compare a ration including a heavy allowance of roots and a moderate allowance of concentrated foods with another ration including a moderate allowance of roots and a high allowance of concentrated foods. The foods used were precisely the same in each ration, the difference simply being in the relative proportions of roots and concentrated foods."

The composition of the different lots of manure produced and their effects upon crops as tested in field trials are reported. It was found that "the difference in composition between the manures produced by animals fed under the same conditions but on different rations may differ widely from that which the composition of the foods consumed would lead one to expect. This is especially the case where the amounts of 'roots' included in the rations differ greatly. The chemical composition of the manures by itself is not a reliable measure of their relative values. . . . The richer manure in each case apparently [gave] the better crop, but the differences in value thus far realized [were] well below those calculated from the chemical composition by the ordinary method of computation."

The effect of watery foods (roots) in increasing the bulk and reducing the fertilizing value of the manure was marked.

The manufacture of nitrates from the atmosphere, E. K. Scott (*Jour. Roy. Soc. Arts, 60 (1912), No. 3104, pp. 645–667, figs. 12; Nature [London], 89 (1912), Nos. 2227, pp. 463–465, figs. 3; 2228, pp. 490–492, figs. 4*).—This is a very complete account of the present status and outlook of this industry, describing the various processes in use, the capacity of the works, the cost of power, and the possible extension of the industry.

The manufacture of nitrates from the atmosphere, H. E. P. Cottrell (*Jour. Roy. Soc. Arts, 60 (1912), No. 3108, pp. 756, 757*).—This article contains statistics on the world's production and consumption of ammonium sulphate and

the consumption of sodium nitrate, 1906 to 1911, inclusive, supplementing data given in the article by E. K. Scott noted above.

Potash salts a protection against frost, MAAS (*Illus. Landw. Ztg., 32 (1912), No. 6, pp. 39, 40, figs. 4*).—Marked effects in preventing frost injury to rye and potatoes by liberal applications of potash salts are reported.

Potash salts a protection against frost, W. GOLTE (*Illus. Landw. Ztg., 32 (1912), No. 10, p. 77; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 4, pp. 902, 903*).—Liberal applications of potash salts apparently prevented frost injury to rye by increasing the concentration of the soil water and thus preventing the freezing of the soil and by withdrawing a certain amount of water from the tissues of the plants.

Fertilizer experiments with ground phonolite, W. THAER (*Jour. Landw., 60 (1912), No. 1, pp. 19–30*).—Comparative tests of 40 per cent potash salt and phonolite on beans and potatoes showed neither appreciable direct action nor after effect of the potash in the phonolite.

Results of investigations of the potash deposits of Upper Alsace, B. FÖRSTER (*Mitt. Geol. Landesanst. Elsass-Lothr., 7 (1911), No. 4, pp. 349–524, pls. 7; abs. in Kali, 6 (1912), No. 4, pp. 77–81; Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 4, pp. 901, 902*).—The character of these deposits as determined by numerous deep borings is described. It is estimated that they are capable of yielding 1,472,058,000 metric tons of 22 per cent potash salts.

The composition of the Pacific kelps, J. W. TURRENTINE (*Jour. Indus. and Engin. Chem., 4 (1912), No. 6, pp. 431–435*).—In analyses of 81 samples of oven-dried seaweeds from the Pacific coast the potash (K_2O) varied from 0.37 per cent (equal to KCl 0.59 per cent) in the stipe of *Pterygophora californica*, to 29.9 per cent (equal to 47.5 per cent KCl) in bulbs of *Pelagophycus porra*.

"When the average potassium chlorid content of the 29 samples of the northern kelps (from Puget Sound) is compared with that of the 27 samples of the southern (from the region of San Diego), the respective values being 21.3 per cent and 23.4 per cent, it appears that the content of the southern plants exceeds that of the northern." However, choosing the 4 varieties in the northern collection which occur in the greatest quantities (the genuses Nereocystis, Macrocystis, Postelsia, and Egregia—9 specimens), the average KCl content is 25.7 per cent, and the 2 genuses of the north considered as a commercial source of potash, Nereocystis and Macrocystis, show an average content for 6 specimens of 29.4 per cent. The average content of the 2 specimens of Macrocystis from Puget Sound is 26.5 per cent; that of the 22 specimens from the south is 21.6 per cent.

"The average iodin content of the 30 specimens from Puget Sound is 0.155 per cent and of the 4 main varieties (10 specimens) is 0.14 per cent. The average of 6 specimens of the 2 giant kelps, the Nereocystis and the Macrocystis, is 0.16 per cent. The average percentage content of the southern kelps is 0.29, a value nearly twice that from the northern kelps."

Of the 3 giant kelps Nereocystis contained on the average 32.6 per cent KCl, 0.14 per cent iodin; Macrocystis 22.2 per cent KCl, 0.27 per cent iodin; and Pelagophycus 31.3 per cent KCl, 0.36 per cent iodin.

In addition to the variations in composition between the varieties of kelps there was a marked variation between members of the same genus from different localities and from the same locality. There is also a variation strikingly shown in the case of Pelagophycus between the different parts of a single plant. These differences have been pointed out by Balch.

From analysis of a limited number of kelps it was found that phosphoric acid varied from 0.51 per cent in *Pelagophycus porra* to 1.84 per cent in *Macrocystis pyrifera*, and sulphur from 1.08 in *Nereocystis leutkeana* to 3.45 in *M. pyrifera*.

Significance of the word kainit, A. ZARAGÜETA (*Jour. Agr. Prat., n. ser., 23 (1912), No. 18, pp. 556, 557*).—It is stated that the natural salt found in the Stassfurt deposits to which the name kainit was originally given has, according to Precht, the formula: $MgCl_2$. K_2SO_4. $MgSO_4$. $6H_2O$. The theoretical composition of kainit is KCl. $MgSO_4$. $3H_2O$, according to Van't Hoff, who showed that Precht was at fault in maintaining that the potassium was present as sulphate. In fact, in all of the natural potash salts of the German mines of most commercial importance the potassium is present as chlorid. The term kainit is used at the mines to designate all products containing from 12.4 to 16 per cent of potash soluble in water, and less than 6 per cent of magnesium chlorid soluble in alcohol. The kainit group is therefore usually a mixture of various salts in which, however, the potassium is always combined with chlorin. Salts containing over 6 per cent of magnesium chlorid soluble in alcohol are classed as carnallite.

Discovery of chalk and phosphatic sands in the Department of the Yonne, France, G. NEGRE (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 20, pp. 1314–1316*).—The geological character and estimated extent of deposits in the vicinity of Sens are briefly discussed.

Report on departmental experiments with ground limestone, H. J. COLBOURN (*Agr. Gaz. Tasmania, 20 (1912), No. 3, pp. 94–97, figs. 2*).—The beneficial effect of ground limestone on mustard and rape in experiments here reported is ascribed to its favorable action on nitrification.

Some bacteriological effects of liming, P. E. BROWN (*Centbl. Bakt. [etc.], 2. Abt., 34 (1912), No. 4–7, pp. 148–172; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 597, II, p. 670*).—This is substantially a reprint of matter contained in Iowa Station Research Bulletin 2 (E. S. R., 23, p. 428).

Experiments on the action of sulphur as a fertilizer in 1911, BERNHARD (*Deut. Landw. Presse, 39 (1912), No. 23, p. 275*).—Experiments are reported which showed marked benefit from applications of sulphur (44 lbs. per plat of 600 sq. yds.) on hoed crops, especially potatoes and mangolds.

The fertilizing action of sulphur, L. DEGRULLY (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 33 (1912), No. 11, pp. 321–324*).—This is mainly a review of investigations by Boullanger (E. S. R., 27, p. 27) and Demolon (E. S. R., 26, p. 819), with reference also to the suggestion of Gastine that the fertilizing effect of carbon bisulphid is due in part at least to the sulphur left in the soil in a fine state of division.

Sulphur as a fertilizer (*Abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 5, pp. 1109–1111*).—This is a review of investigations by Boullanger, Demolon, Bernhard, and Degrully, referred to above.

Sand and ashes from Vesuvius, E. CASORIA (*Ann. R. Scuola Sup. Agr. Portici, 2. ser., 9 (1910), Art. 6, pp. 26*).—Analyses of a large number of samples show generally a rather high percentage of potash (about 7 per cent in some cases) and about 0.75 per cent of phosphoric acid.

Artificial manures in Hungary, DE MIKLÓS DE MIKLOSVÁR (*Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 4, pp. 899, 900*).—It is stated that the use of fertilizers is increasing each year with the growing improvement in agriculture. The conditions under which the National Hungarian Agricultural Association will give prizes for the best articles on the importance of the use of superphosphates in Hungary are stated.

The consumption of chemical and mineral fertilizers in Spain, T. CALLEGO (*Mem. Dir. Gen. Agr., Minas y Montes [Spain], 1912, pp. 361–365, pl. 1; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 5, pp. 1113, 1114*).—Statistics collected by the ministry of agriculture show a marked increase in the use of fertilizers due to an energetic propaganda, low prices, improved laws relating to inspection and purchase, and formation of purchasing associations. It is estimated that the total consumption in Spain in 1911 was 581,320 metric tons, of which 82,580 tons was consumed in Valencia alone. A large proportion of the fertilizers is now imported.

Inspection and analyses of commercial fertilizers in Mississippi, 1911–12, W. F. HAND ET AL. (*Mississippi Sta. Circ. 34, pp. 31*).—This circular contains the analyses and valuations of 88 samples of fertilizer drawn by regular inspectors and also guaranties for all brands registered to date.

Analyses of fertilizers, spring season, 1912, B. W. KILGORE ET AL. (*Bul. N. C. Dept. Agr., 33 (1912), No. 4, pp. 95*).—This bulletin contains analyses of fertilizers collected by the fertilizer inspectors of the state department of agriculture during the spring of 1912, as well as a list of brands of fertilizers registered for sale during the season 1911–12.

The inspection of cotton-seed meal, season 1911–12, W. F. HAND ET AL. (*Mississippi Sta. Bul. 156, pp. 3–33*).—This bulletin contains tables of analyses of samples of cotton-seed meal drawn by inspectors from shipments in various parts of the State and of so-called official samples forwarded by oil mills in accordance with the requirements of the law. The valuation of cotton-seed meal is briefly discussed.

The mixing of fertilizers, G. VECCHI (*Riv. Agr. [Parma], 18 (1912), No. 23, pp. 355–357*).—This is a brief discussion containing a convenient table showing compatibles and incompatibles in fertilizing materials.

Home mixing and general fertilizer formulas (*South Carolina Sta. Circ. 4, pp. 7*).—Forty formulas for the use of farmers in preparing home mixtures of fertilizers are given.

AGRICULTURAL BOTANY.

Practical botany, J. Y. BERGEN and O. W. CALDWELL (*Boston, New York, Chicago, and London, 1911, pp. VII+545, figs. 388*).—This book is designed to supply the needs of students in secondary schools, the recommendations regarding the botanical courses suggested by the Botanical Society of America and the North Central Association of Colleges and Secondary Schools being followed. After treating of plant life and structures, the great groups of plants are discussed at some length. The authors include the principles of plant nutrition, and the relation of plant nutrition to soils and climate and to the food of animals and men. Discussions are also given of diseases produced by parasitic plants, the propagation of plants, plant breeding, forestry, and the main uses of plants and plant products.

The relative amount of information of economic importance that is included in this work makes it appear to be well adapted to secondary schools, particularly those leading to higher institutions where the economic relations of plants are featured.

A laboratory manual of general agricultural bacteriology, E. G. HASTINGS, C. HOFFMANN, and W. H. WRIGHT (*Madison: Univ. Wis., 1911, pp. 47*).—This manual gives an outline of a course of laboratory instruction which is designed to convey to the student some of the principal relations of bacteria to farm operations and to illustrate their importance in the daily life of the farm. The

four principal divisions treated are soil bacteriology, dairy bacteriology, the bacteriology of the diseases of animals, and the bacteriology of foods.

A biologic and taxonomic study of the genus Gymnosporangium, F. D. KERN (*Bul. N. Y. Bot. Gard., 7 (1911), No. 26, pp. 391–494, pls. 11, figs. 36*).—The results of a study begun at the Indiana Station in 1906 on the biology and taxonomy of the genus Gymnosporangium are given. Preliminary notes on some of the phases of the investigation have appeared previously (E. S. R., 19, p. 754; 20, p. 453; 23, p. 354).

The author recognizes 40 species of the fungus, all of which are described at length. Under the biological studies accounts are given of experimental investigations on the life histories of different species of the fungus. Cultures were made of 26 species and in 18 they were successful. Of this number 9 were cultivated for the first time and their alternate hosts demonstrated, the others confirming previous reports.

The economic importance of the species is discussed, especially those whose æcidial forms occur on such trees as the apple, pear, and quince. The methods of control that have been suggested are reviewed, and the author points out some of the difficulties attending spraying by reason of the prolonged season of the maturing of the teleutospores. The planting of resistant varieties of apples, pears, etc., is thought to offer promising results.

Natural history, morphology, and cytology of Azotobacter chroococcum, A. PRAZMOWSKI (*Centbl. Bakt. [etc.], 2. Abt., 33 (1912), No. 11–14, pp. 292–305*).—This is a somewhat detailed biological study of this dimorphic schizomycete.

It is stated that morphologically it presents itself in its first or vegetative stage as a bacterium, in the fruiting stage as a micrococcus. Under certain circumstances it resembles a ciliated free-moving fission fungus. The division of the nucleus marks the first step in cell division. In the resting stage the nucleus assumes a globular form, having a strongly refractive nucleolus, with clearly differentiated bounding layer. The individuality of the nucleus appears to be practically lost at times owing to its relations to the cytoplasm. The so-called sarcina forms are said to be morphologically and physiologically similar to the endogenous spores of other bacteria, in particular *Bacillus bütschlii*.

The physiology of denitrifying bacteria, H. VON CARON (*Centbl. Bakt. [etc.], 2. Abt., 33 (1912), No. 1–6, pp. 62–116*).—This is an account of the author's studies in extension of the work of Koch and Pettit (E. S. R., 23, p. 123), employing cultures in soil of 3 common denitrifying bacteria, viz, *Bacterium hartlebi*, *Bacillus pyocyaneus*, and *Bacterium fluorescens liquefaciens*. The investigations relate to the requirement and utilization of food and energy materials by these bacteria in denitrification and the influence of atmospheric oxygen in that process. The principal conclusions announced are as follows:

Dextrose is a most suitable source of energy for nitrate reduction. So is fresh straw; but in rotting this loses much of its available carbon, so that compost seldom shows much loss of nitrates by bacterial activity. Cellulose may also serve as a source of energy in mixed cultures but in less degree. Other sources of energy of varying availability are mentioned. The addition of nitrogen increases the rate of denitrification, and this rises toward a maximum of intensity per unit of energy used.

Investigations in the presence of hydrogen tend to confirm the view that denitrifying bacteria are responsible for the loss of nitrates observed to occur in the presence of a source of energy and of nitrates with exclusion of air. The hydrogen is said to play here the rôle of a too high water content in the soil; whence it is inferred that any means of excluding air in soils may lead to

nitrate destruction by these bacteria when present and other conditions are favorable.

The most divergent denitrifying organisms appear to act in the same ways on exclusion of oxygen. Simultaneously with the admission of air an increase of proteins occurs with coincident increase of energy requirement. The most diverse experiments indicate that the degree of air access did not affect the relation between synthesis and use of energy material.

The 3 bacteria studied do not show the same activity and nitrate requirement per unit of energy material used. The optimal relation between the carbon and the nitrate used is for the 2 stronger bacteria (*B. pyocyaneus* and *B. fluorescens liquefaciens*) 1 per cent dextrose to 1.6 per cent potassium nitrate. Reduction of nitrate supply far below that of carbon greatly reduces the intensity of the process. All of these 3 kinds of bacteria use carbon the more freely as more individuals are present. With a sugar concentration of more than 1 or 2 per cent, a depression of denitrification occurs, as thereby (through the building of fatty acids) the development of the denitrifying bacteria is retarded. The increase of alkaline carbonates has the opposite effect. Increased concentration of dextrose within limits is accompanied by its increased employment as a source of energy.

These experiments confirm the findings of Koch and Pettit and of Marr (E. S. R., 23, p. 430) that in the soil, under otherwise favorable conditions of moisture, etc., a loss of nitrates may still occur. No certain explanation is at hand, but the suggestion is made that an increased production of carbon dioxid and the indirectly produced exclusion of air may in part account for the destruction of nitrates observed.

It is suggested also that an explanation may now be expected of the very different results obtained by investigators, and that a point of departure for investigations of great importance has been reached.

Metabolism and translocation in young foliage trees, H. Bauer (*Naturw. Ztschr. Forst u. Landw., 9 (1911), No. 9, pp. 409–419*).—This is a further account of the author's investigations of the nutritive changes in young trees (E. S. R., 25, p. 27). This report gives detailed and tabulated particulars of changes (expressed in percentages) observed in the study of the second year's growth of ash trees during the four successive periods of about 80, 50, 70, and 60 days, extending from February 27 to November 17.

The periodicity of nutritive processes in young beeches, W. Kübler (*Naturw. Ztschr. Forst u. Landw., 10 (1912), No. 4–5, pp. 161–187, figs. 2*).—This is contributory to the work of E. Ramann (E. S. R., 26, p. 443; 27, p. 229) and of H. Bauer (see above). The author investigated the seasonal changes occurring in beeches of 2 years' growth as regards nutritive requirements, the formation of dry substance, etc., in the plants. The results are given in tabular form of analyses made of the whole plant, of stem and root, together and separately, and of the leaves.

The results as regards the whole plant, which are graphically represented, show that phosphoric acid, nitrogen, potash, lime, and magnesia (which follow much the same general course but show individual differences) all decrease until early in May. The percentages then rise sharply until about the middle of September when a decline almost as steep sets in, reaching by November approximately the same levels as about the middle of July. The curves are very much steeper in case of those plants grown under the more favorable conditions.

The periodicity of synthetic processes in young foliage trees, H. Bauer (*Naturw. Ztschr. Forst u. Landw., 10 (1912), No. 4–5, pp. 188–199*).—This is a report in continuation of the work carried on by this author, E. Ramann, and

W. Kiibler (see above). Beginning on March 15 with oaks about 1 year old, analyses were made of the growing plants after four successive periods of 70, 32, 36, and 50 days, closing September 19. The results of these numerous analyses as regards potash, soda, lime, magnesia, oxid of iron, silicic acid, and nitrogen found in the whole plant, the stem and root, and the foliage, respectively, are given in tabular form.

The relations between changes in protein structure and respiration.—I, The influence of atmospheric oxygen on proteolytic ferments in plants, W. PALLADIN and G. KRAULE (*Biochem. Ztschr., 39 (1912), No. 3-4, pp. 299-301*).—From studies of *Agaricus campestris* and etiolated leaves of *Vicia faba*, both in ordinary air and in an oxygen-free atmosphere, the authors conclude that autolysis of proteins in killed plants is increased by the presence of oxygen in the amount found in ordinary air, especially where the plants are of loose structure. The dependence of autolysis upon oxygen is probably indirect. It is claimed that the various ferments present may work independently or even antagonistically in the cells of the dead plants, but that the conditions most favorable to the work of such ferments have not yet been ascertained.

The significance of respiration pigments in the oxidation processes of plants, W. PALLADIN (*Ber. Deut. Bot. Gesell., 30 (1912), No. 3, pp. 104–107*).—In continuation of previous work (E. S. R., 25, p. 124; 26, p. 326), the author presents a preliminary report on his later investigations on this subject, the principal conclusions being as follows:

(1) The rôle played by respiration pigments in the oxidation processes consists in the withdrawal of hydrogen from the substance to be used as an oxidizer. (2) The oxidases are water-forming ferments. (3) During respiration all the hydrogen of the glucose is oxidized exclusively through the oxygen of the air. (4) The water formed during respiration is exclusively of aerobic origin. (5) The oxidation of glucose, with the aid of respiratory pigments, takes place with participation of water. (6) The oxidation of glucose during respiration goes on with the employment partly of the oxygen from the water assimilated in the process of respiration, partly of that from the glucose. (7) During respiration, water is not only separated but is also assimilated. A brief discussion is given of some of the changes involved in these processes.

The influence of diastase and of emulsin on alcoholic fermentation and the respiration of plants, S. L'vov (*Ztschr. Gärungsphysiol., 1 (1912), No. 1, pp. 19–44, fig. 1*).—Substantially the same as an article already noted (E. S. R., 27, p. 221).

The relation of protoplasmic-streaming movements to movements of starch grains within the cells, A. L. HEILBRONN (*Ber. Deut. Bot. Gesell., 30 (1912), No. 3, pp. 142–146*).—A preliminary report on investigations still in progress.

In the course of his studies, first with *Phaseolus multiflorus* and *Vicia faba* and later with *Calceolaria chelidonioides*, *Verbascum thapsus*, and *Mimulus moschatus*, the author found that if cells are placed in their natural position with the starch grains lying on the lower cell wall and the cells are then rotated through 180° the grains after 10 or 15 minutes begin to descend, partly in consequence of protoplasmic movement but partly by gravity, some passing through the vacuole, each grain or group in such case pulling through after it a thread of protoplasm. After reaching the bottom, which required from 10 to 28 minutes, the grains were observed to be carried upward and around by the protoplasmic movement which, once started, persisted for from 40 to 70 minutes.

The author expresses the opinion that either the weight of the starch is the stimulus to further motion of the plasma to which the cell reacts in this way, or

else that the effects of the friction of the starch grains or the impetus of their descent are communicated to the medium. It is suggested that a way is thus opened for further study of the properties of the several cell contents.

The carbohydrates of the snowdrop leaf and their bearing on the first sugar of photosynthesis, J. PARKIN (*Bio-Chem. Jour., 6 (1911), No. 1, pp. 1–47, fig. 1*).—This is a fuller account of work already in part reported (E. S. R., 21, p. 319).

The results as first given have been confirmed. Only 3 carbohydrates were present in these leaves in appreciable quantity, viz, sucrose, glucose, and fructose. The total quantity of these in a leaf was from 20 to 30 per cent of the dry substance, or from 4 to 6 per cent of the fresh, active leaf. The greater proportion in the lower part of the leaf may be due to the greater shading of this part as the amount was greater in leaves from thick clumps. The lower part of the leaf seems to function somewhat as storage tissue for sugars when obscured. It seems that, as spring advances, the hexoses increase at the expense of the sucrose. The leaves, when detached and insolated, contain decidedly more sucrose than their controls, while the quantity of hexoses remains much the same. The fructose as a rule is in excess of the glucose. Leaves when darkened lose sucrose rapidly during the first 48 hours, after which the proportion remains fairly constant.

In general, the results favor the conclusion announced by Brown and Morris that sucrose is the first sugar to arise on photosynthesis, and that the two hexoses, glucose and fructose, as well as starch, are derived from sucrose. Important services by sucrose in relation to circulation, storage, and transformation purposes are suggested.

The origin and function of pentosans in plants, C. RAVENNA, O. CERESER, and O. MONTANARI (*Gaz. Chim. Ital., 41 (1911), II, No. 2, pp. 115–129*).—Substantially the same work as previously reported (E. S. R., 24, p. 228), with the conclusions that the pentosans probably have their origin in sugars and that among other functions they perform that of storage of reserve materials.

The significance of mucilage in the germination of seeds, C. RAVENNA and M. ZAMORANI (*Gaz. Chim. Ital., 41 (1911), II, No. 2, pp. 138–143*).—This is substantially the same as a report previously noted (E. S. R., 24, p. 534).

Dimorphism of chlorophyll grains in some plants, U. GIOVANNOZZI (*Nuovo Gior. Bot. Ital., n. ser., 19 (1912), No. 1, pp. 39–51, figs. 2*).—Studies carried on with numerous plants, more particularly *Portulaca oleracea* and *Alternanthera sessilis amœna*, led the investigator to the conclusion that the dimorphism of chloroplasts, observed in numerous and widely separated groups, is related to the environment of the plant and the principal function of the cells under observation. In leaf parenchyma of mainly assimilative function the chloroplasts were found to be larger and more active, while in regions more concerned with conduction these grains were reduced in size and seemed to be less active. Heat, dryness, and light also appear to show some relation to the differences observed.

Remarks on a new method of studying stomatal aperture of stomata, EMMY STEIN (*Ber. Deut. Bot. Gesell., 30 (1912), No. 2, pp. 66–68*).—Concerning the method described by Molisch (E. S. R., 27, p. 221) which is stated to have been previously discovered and used by others, the author makes the following claims:

The number of substances suitable for the purposes of infiltration is much larger and the range of possibilities of the method is much greater than claimed by Molisch. For example, melted paraffin, entering only wide apertures, and petroleum ether, which penetrates exceedingly minute ones, are much further apart than are alcohol and benzol. It is claimed that estimates of apertures

may be made with a high degree of accuracy beyond the point where Molisch regarded the stomata as practically closed. Also, these more sensitive indicators are less injurious to the cells than are benzol and xylol.

Heterozygosis in evolution and in plant breeding, E. M. East and H. K. Hayes (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 243, pp. 58, pls. 8*).—In cooperative work between this Department, the Connecticut State Station, and the Bussey Institution, the authors have studied heterozygosis in evolution and in plant breeding, predicating their belief that Mendel's law—that is, the segregation of character factors in the germ cells of hybrids and their chance recombination in sexual fusions—is a general law; that stimulus to development is greater when certain, or possibly all, characters are in the heterozygous condition than when they are in a homozygous condition; and that this stimulus to development is cumulative up to a limiting point and varies directly with the number of heterozygous factors in the organism.

Their studies were made with 30 varieties of maize and several species of Nicotiana. As a result of their investigations the authors believe they have demonstrated that "the decrease in vigor due to inbreeding naturally cross-fertilized species and the increase in vigor due to crossing naturally self-fertilized species are manifestations of one phenomenon, heterozygosis. Crossing produces heterozygosis in all characters by which the parent plants differ. Inbreeding tends to produce homozygosis automatically. The phenomenon exists and is in fact widespread in the vegetable kingdom. Inbreeding is not injurious in itself, but weak types kept in existence in a cross-fertilized species through heterozygosis may be isolated by its means. Weak types appear in self-fertilized species, but are eliminated because they must stand or fall by their own merits."

The experimental data upon which these conclusions are based have been obtained entirely from plants, but observations on animal hybrids and published records lead the authors to believe that the facts are the same among animals, and that their conclusions will apply equally to the animal and the vegetable kingdoms where organisms are reproduced sexually.

A bibliography is appended.

The inheritance of red color, and the regularity of self-fertilization in the common jute plant, R. S. Finlow and I. H. Burkill (*Mem. Dept. Agr. India, Bot. Ser., 4 (1912), No. 4, pp. 73–92*).—From 1902 to 1907 the authors made a survey of the different races of jute cultivated in India, and as a result of their survey they recognize 33 races, including 3 which are grown as vegetables. These are grouped according to color types, and the inheritance of color in them is shown.

It is stated that when a pure green jute is crossed with a fixed red plant the Mendelian law is obeyed, the red acting as a simple dominant. The F_1 generation of hybrids appears to consist of plants of one tint of redness. The F_2 generation, on the other hand, varies widely in the amount of red color the plants contain.

The authors in their studies found that self-fertilization is the rule with this plant, probably not more than 2 per cent of the plants under the most favorable conditions being the result of cross breeding.

Department of botanical research, D. T. MacDougal (*Carnegie Inst. Washington Year Book, 10 (1911), pp. 49–68, pl. 1*).—An outline is given of the investigations carried on by the staff attached to the botanical research laboratory at Tucson, Ariz., a number of the investigations having been previously reported upon at length (E. S. R., 25, pp. 219, 327, 732; 26, pp. 433, 532, 628; 27, pp. 29, 329, 331).

FIELD CROPS.

Water requirements of crops in India, II, J. W. LEATHER (*Mem. Dept. Agr. India, Chem. Ser., 1 (1911), No. 10, pp. 205–281, pl. 1, figs. 34*).—Earlier work by this author on the same subject has already been noted (E. S. R., 23, p. 331).

Tables and charts present data on the amount of water transpired by corn, wheat, flax, barley, oats, gram (*Cicer arietinum*), peas, sugar cane, and rutabagas on various soils, in pots of different sizes, and when treated with various fertilizers. From these and other data presented the author draws certain conclusions.

The ratios between the amounts of water transpired and the crop weights produced were apparently not affected by the nature of the soil so long as the water supply did not fall below a certain concentration. The concentration of water in the soil required for good development varied with the soil. In the Pusa soil, 10 per cent was sufficient for good plants, but in a soil designated by the author as black cotton soil, 25 per cent sufficed only for the most meager growth. The reduction in concentration in the Pusa soil was more or less uniform for about 5 or 6 ft., below which the change was smaller. After allowing for the moisture which evaporated directly from the soil into the air, a comparison of the observed decrease of water in a unit column of soil with the crop weight produced gave approximately the same ratio as that obtained by the pot culture method. Thus most of the water required was accounted for by the observed decrease of water within the root range, while the data obtained in these experiments may be accounted for by supposing that the quantity of water which moves through the soil in a time unit is dependent on concentration, distance, and physical character of the soil. The author believes that temperature also has an important influence and that a laboratory method for the estimate of the soil's water-conducting capacity would be desirable.

[Dry farming soil preparation methods], A. E. V. RICHARDSON (*Dept. Agr. So. Aust., Rpt. Dry Farming Conf., 1 (1911), pp. 14, 15*).—The results given are for the third year of a test already noted (E. S. R., 26, p. 631).

During this third season only slight differences could be attributed to variations in time or frequency of subpacking. The 3 plats plowed 6 in. deep gave slightly lower yields than those plowed only 4 in. deep. From the test as a whole, however, the author concludes that subpacking gives a substantial profit under the conditions obtaining at Hammond in South Australia.

[Field crops at the Delta substation, 1911], G. B. WALKER (*Mississippi Sta. Bul. 157, pp. 3–10, 13–23, figs. 4*).—In a variety test of wheat the estimated yields ranged from 16 to 35 bu. per acre, the leading varieties apparently being Blue Stem and Klondike.

In a fertilizer test with cotton of cotton-seed meal, acid phosphate, and kainit applied singly and in various mixtures, the highest yields and the greatest net increases in value, after deducting the cost of fertilizers, followed applications of (1) 200 lbs. cotton-seed meal and 50 lbs. kainit, (2) 200 lbs. cotton-seed meal, 150 lbs. acid phosphate, and 50 lbs. kainit, and (3) 150 lbs. acid phosphate, and 50 lbs. kainit. In a test of applications of lime alone and in a mixture with other materials the yield of 1,366 lbs. of seed cotton per acre followed an application of 1,000 lbs. of lime as compared with 1,516 lbs. on the check plat, and 1,666 lbs. after an application of 200 lbs. cotton-seed meal, 150 lbs. acid phosphate, 50 lbs. kainit, and 1,000 lbs. lime. In another test the total seed cotton yield on the check plat was 1,549 lbs. as compared with 1,649 lbs. after what the author terms a normal application of 200 lbs. cotton-seed meal, 150 lbs. acid phosphate, and 50 lbs. kainit. A yield of 1,733 lbs. followed an application of double this normal mixture.

In another comparison "of varying amounts of cotton-seed meal, acid phosphate, and kainit, other elements being normal, with no fertilizer," the highest yield followed an application of 600 lbs. cotton-seed meal, 150 lbs. acid phosphate, and 50 lbs. kainit, but the highest net profit followed the use of 200 lbs. cotton-seed meal, 150 lbs. acid phosphate, and 50 lbs. kainit. On another plat, however, this latter mixture was applied at an apparent financial loss. In a test of different nitrogen sources and of applications made entirely at planting time, or half at planting and half on July 20, 2,483 lbs. of seed cotton per acre was obtained after fertilization with 80 lbs. of nitrate of soda on each of these two dates as compared with 2,133 lbs. when 160 lbs. were applied at planting time. An application of 400 lbs. of cotton-seed meal was followed by a lower yield than that secured on the check plat. An application of 200 lbs. of cotton-seed meal at planting time and 80 lbs. of nitrate of soda, July 20, was followed by a yield of 2,216 lbs. of seed cotton per acre. This application ranked second in value of increased yield over the cost of the fertilizer used, the divided application of nitrate of soda being first in this respect as well as in yield. Spacing and variety tests are noted on page 434.

Better yields of peanuts were obtained from plants planted during the first week in June than on other dates, and from plantings 16 in. apart in rows 3 ft. apart than at other distances. No increase in yield followed the use of fertilizers for peanuts on a fertile sandy loam.

Brief progress reports are also given on tests with corn, alfalfa, oats, and soy beans, and with wheat and vetch followed by soy beans.

[Cabbage and potatoes at the New Mexico Station], F. Garcia (*New Mexico Sta. Rpt. 1911, pp. 33–37, fig. 1*).—Four different plantings of cabbage were made at intervals of about 2 weeks, beginning March 2. The earliest planting gave the best results on the whole, but the second planting did almost as well, while the last planting, made April 17, was too late to do much good.

Practically no yields of potatoes were secured in either plat or pot tests. The plants in pots in a more humid section of the greenhouse grew considerably taller than those in the drier portion or those in the field, but the size of the vines did not seem to affect materially the size or yield of tubers.

Results of cooperative experimental work for 1911, F. G. Tarbox, Jr. (*South Carolina Sta. Circ. 5, pp. 3–19*).—The results of cooperative experiments the station is conducting with farmers in the State are briefly noted. In the spring of 1911, the station distributed among the farmers of the State for this work about 140 bu. of cotton seed, about 60 bu. of corn of the Marlboro Prolific, Boone County White, and Coker Williamson varieties, and a quantity of seed of winter cover crops, including vetch, clover, and rye.

Tables of field crops, J. N. Harper (*South Carolina Sta. Circ. 2, pp. 18*).—Popular information regarding the culture of field crops adapted to the South is presented in tabular form.

Competition in cereals, E. G. Montgomery (*Nebraska Sta. Bul. 127, pp. 3–22, figs. 7*).—This bulletin states the results of tests in which wheat and oats were planted ¼, ½, 1, 1½, and 2 in. apart in rows to determine the percentage of plants which survive competition of these different degrees of intensity. The competition of well developed with poorly developed kernels and of one variety with another was also tested. Data are presented in 19 tables from which the author concludes that the percentage of plants which survive until harvest decreases as the rate of planting is increased. In these tests the total decrease amounted to 34 per cent and the relative survival of the thinnest and thickest stands averaged 75 and 56 per cent, respectively.

When plump and small or poorly developed seed were alternated in the same row, the decrease in number of plants was 28 and 38 per cent, respectively, but

when the same grades were planted alone the decreases were 35 and 40 per cent. Plants from all grades decreased markedly from various causes besides competition. Since natural elimination of weaklings from either large or small seed has been going on for ages, it would seem that artificial seed separation by fanning mill or screens could not increase the efficiency of seed, particularly since the usual method of thick seeding permits the natural elimination of one-half the plants without affecting the yields.

The desirability of separating pure strains is indicated by the fact that the variety which when sown alone is the best yielder, in a mixed sowing may be dominated by a less productive type. When the seeds of 2 varieties were alternated in the same row, the yield of the mixture was always greater than that of either variety alone. Seed from corn strains which had been grown for 6 years at the rates of 1, 3, and 5 plants per hill averaged 34.9, 38.5, and 41 bu. per acre, respectively, in 1911.

The manuring of grass land (*Univ. Col. Reading, Dept. Agr. and Hort. Bul. 13, 1910; abs. in Jour. Bd. Agr.* [*London*], *18* (*1912*), *No. 11, p. 941*).—A brief progress report on fertilizer and other tests conducted at 9 points in Oxfordshire in 1909–10. Phosphorus applications gave profitable returns in most localities and the addition of potash and nitrogen still further increased the yields.

The manuring of grass land (*Univ. Col. Reading, Dept. Agr. and Hort. Bul. 13, 1910; abs. in Jour. Bd. Agr.* [*London*], *18* (*1912*), *No. 11, p. 941*).—This is a report of tests similar to those noted above, but conducted at 18 points in Bucks.

The grasses and grass-like plants of New Mexico, E. O. Wooton and P. C. Standley (*New Mexico Sta. Bul. 81, pp. 176, pls. 12, figs. 32*).—This bulletin is intended to supply information with regard to the individual grasses and grass-like plants of New Mexico to dry farmers, stockmen, and students. It contains a tentative relief map and an outline map showing the distribution of the principal grass societies, a technical description of each species, and a key for their determination.

Studies in Indian fiber plants, A. and G. L. C. Howard (*Mem. Dept. Agr. India, Bot. Ser., 4* (*1911*), *No. 2, pp. 9–36, pls. 7*).—Notes are given on the botanical and other characters of varieties and types of *Hibiscus cannabinus* and *H. sabdariffa*.

Peruvian alfalfa, A. Opazo (*An. Agron.* [*Santiago de Chile*], *6* (*1911*), *No. 3–4, pp. 365–375*).—A brief account is given of tests of Peruvian and Chilean alfalfa sown separately and mixed in various proportions. Physical and chemical analyses of the soil of the Coquimbo experiment fields are also reported.

Lucern (*Jour. New Zeal. Dept. Agr., 4* (*1912*), *No. 3, pp. 188–190, figs. 2*).—Notes on the vegetation habits of a number of alfalfa varieties tested are given.

Tests of treated and untreated beet seed, H. K. Günther (*Centbl. Zuckerindus., 19* (*1911*), *No. 30, p. 1021; abs. in Centbl. Bakt.* [*etc.*], *2. Abt., 32* (*1912*), *No. 6–12, p. 308*).—Additional tests of prepared seed (E. S. R., 25, p. 135) showed a greater percentage of germination, a higher degree of resistance to injurious influences, and a tendency to earlier sprouting. It is stated also that the favorable yield reported from the earlier observations was maintained.

Germination tests of the different colored seeds of red clover, B. Kajanus (*Landw. Jahrb., 41* (*1911*), *No. 3–4, pp. 527–533*).—Tables state in full the data obtained in germination and other tests of red clover seed of different colors. The relation of color to rate of germination is also discussed, and a bibliography of 4 titles is given.

Yellow and brown seeds appeared about equal in weight, but violet seeds were much heavier. Violet seeds germinated somewhat better than yellow ones and both excelled brown seeds in this respect. The percentage of hard seed was

exceedingly variable, and although it averaged lowest among the violet and highest among the brown seeds it had no apparent connection with color.

Native seed corn, E. G. MONTGOMERY (*Nebraska Sta. Bul. 126, pp. 3–13, figs. 4*).—At the Nebraska Station native seed of 6 leading corn varieties was compared for 2 and 3 years with that grown in either Iowa or Illinois. In every case the native seed gave the better yield, the average difference being 6.2 bu. These tests were conducted during the period 1903–1905. In 1909 seed representing 3 different degrees of acclimatization was tested. Show corn of 5 varieties grown in Illinois, Indiana, and Ohio produced average yields of 39.8 bu. per acre as compared with 45.6 bu. per acre in case of 5 varieties of Nebraska-grown seed and 48.8 bu. per acre in case of 7 local varieties grown near the station.

In central and western Nebraska a number of farmers conducted cooperative tests in 1908–9. In 1908 varieties native to the localities of those reporting averaged 30.5 bu. per acre as compared with 24.1 bu. per acre from seed furnished by the station from western or central Nebraska. In 1909 the varieties could be divided into 3 groups: Those from eastern Nebraska, which gave an average yield of 20.9 bu. per acre, those from central and western Nebraska which averaged 21.9, and those from the growers' own or native seed which averaged 25.4 bu. per acre.

It is concluded that it will be safer for growers in western Nebraska to use their native seed than to try importing seed, even from the eastern part of the State.

Studies in water requirements of corn, E. G. MONTGOMERY and T. A. KIESSELBACH (*Nebraska Sta. Bul. 128, pp. 3–15, figs. 4*).—The authors summarize the results of earlier work at this station on the water requirements of corn, already noted (E. S. R., 24, p. 137; 25, p. 832).

As it has been noted in the past that water loss was more closely related to humidity than to any other factor, the humidity of one greenhouse was maintained at that of the surrounding atmosphere by leaving it open, while that of another was kept much higher by means of atomizers and wet floors. Eight corn plants were grown in each house. Some of the data collected for those grown in the dry and humid greenhouses, respectively, were mean relative humidity at night, 48 and 72 per cent; by day, 37 and 58 per cent; mean temperature at night, 80 and 75° F.; by day 91 and 88°; total weight of 8 plants, 670.36 and 861.77 gm.; average leaf area per plant, 1,079 and 1,070 sq. in.; total water used, 227.785 and 184.230 kg.; water to produce 1 gm. of dry matter, 340 and 191 gm.; water per square inch of leaf area, 27.3 and 19.2 gm.; and water evaporated from 36 sq. in. of free surface, 3,891 and 2,187 gm. These figures are for 1911. In 1910 and 1911, 250 and 345 gm. of water, respectively, were required per gram of dry matter produced.

In work on the relation of water requirements to soil fertility, 3 lots of 4 cans each were filled respectively with an infertile, residual sandstone soil, a quite fertile black alluvial pasture soil, and a mixture of the two. Another series of cans also received 2.4 lbs. per can of moisture-free sheep manure, equivalent to an application of 12 tons per acre. Analyses of the soils used are given. The water requirements of the infertile, intermediate, and quite fertile soils were found to be 549.5, 478.9 and 391.8 gm., respectively, per gram of dry matter produced as compared with 350.3, 341.3, and 346.6 gm. in case of the manured soils. For the fertile soil the decrease was small, and it is considered doubtful whether, under field conditions, adding manure to soils of good fertility would decrease the water requirements.

The "Williamson Plan" of corn culture (*South Carolina Sta. Circ. 3, pp. 8*).—A description of the Williamson method reprinted from Bulletin 124 (E. S. R., 18, p. 731).

Cotton in Hawaii, C. K. McClelland and C. A. Sahr (*Hawaii Sta. Press Bul. 34, pp. 24, figs. 2*).—This is a report on the cotton industry of the Hawaiian Islands, which contains directions for the production of the crop and a statement of the results of experiments on Sea Island and Caravonica cottons in continuation of earlier work (E. S. R., 27, p. 135).

As regards Caravonica cotton, "the yield per acre upon the station grounds from 1-year-old trees which had been pruned in December, 1910, was at a rate of 531 lbs. of lint per acre. Upon similar trees pruned in March, 1911, the yield was only at the rate of 363 lbs. per acre, the average yield upon the field being 448 lbs. per acre, which is approximately four times the yield that was obtained from the same field in 1910."

Pinching back undertaken to induce the growth of fruiting branches and increase the yield restricted vegetative growth but showed no great effect on the yield.

A brief note is given on a trial of semiannual pruning and the production of 2 crops per year by E. C. Smith, a pioneer cotton grower of Pearl City, Oahu. The method consists in picking a crop in June and July, immediately pruning back the plants and giving enough irrigation to start new growth, which makes a crop in December and January. At this time another pruning is given which results in another crop in June and July. "Upon 3-year-old plants pruned in July of 1910 a winter crop of 2.5 lbs. per tree was obtained, while in the following July 4.7 lbs. were picked, making a total of over 7 lbs. seed cotton per tree for the year." This includes all the cotton which opened on the pruned branches within 2 weeks after pruning. When the entire neighborhood follows this method the cotton bollworm can be controlled at nominal expense.

Sea Island cotton seemed to thrive better as an annual than as a perennial, and an acre produced 292 lbs. of lint.

Recent cotton experiments (*Mississippi Sta. Bul. 155, pp. 29*).—This is a continuation of earlier cotton experiments in Mississippi (E. S. R., 23, p. 39), and consists of 4 papers.

I. *Results from the Central Experiment Station*, J. W. Fox et al. (pp. 4–14).—Meteorological data are followed by a statement of the results of a variety test in which Sunflower, Rowden 116, Columbia, and Cook stood highest in total value of lint and seed per acre in 1911. In 1910, 5 strains of Cook and the Triumph and Covington-Toole varieties constituted the first 7 in money value.

Applications of 288 lbs. each of kainit and acid phosphate were followed by approximately equal 5-year average yields, both greater than those secured when either was applied with cotton-seed meal or when both were used together. Still higher yields, however, followed the application of 8 tons of manure or of 4 tons of manure with phosphate, kainit, or lime. Another table states the relative earliness of the crop secured after the various applications in different fertilizer tests in 1911.

"The application of from 200 to 400 lbs. of potash to land on which cotton rusts badly is usually profitable." "We do not get profitable results from potash used here on soils where cotton does not rust."

Cotton topped July 15 and August 1 yielded 1,931 and 1,788 lbs. of seed cotton per acre, respectively, as compared with 1,756 lbs. secured from the untopped cotton. The order of yields was exactly reversed in 1910, but the dates of topping were about a week later. In 1909 the untopped cotton and that topped

August 1 yielded 1,464 and 1,580 lbs. per acre, respectively. In 1907 the cotton topped August 3 yielded 1,808 lbs., as compared with 1,575 lbs. on the check plat, and that topped August 26 yielded 1,780 lbs. as compared with 1,821 on the corresponding untopped or check plat.

Rows 3 ft. apart produced more cotton than those farther apart, in 1911, but were not included in the 1909 test when 4-ft. rows gave greater yields than either 5 or 6 ft. rows. In these tests the plants averaged 15 in. apart in the row. In rows 3 ft. 8 in. apart, plants spaced 12 in. apart gave greater 2-year average yields per acre than those spaced 20 or 30 in. apart.

Poisoning the army worm on August 20 and 30 resulted in a yield of 1,414 lbs. of seed cotton per acre as compared with 767 lbs. on the untreated plats. Paris green appeared to be more effective than arsenate of lead.

II. *Results from the McNeil Experiment Station*, E. R. Ferris (pp. 14–21).—Meteorological data are followed by a statement of the results of a variety test in which Ashcraft Double Jointed Snow Bank, Trice, and Truitt 90-day produced the highest yields.

A table states the 6-year average results secured in a test of various fertilizers. The highest yields were obtained after applications of (1) 100 lbs. each of cotton-seed meal and acid phosphate, and (2) 100 lbs. each of cotton-seed meal, acid phosphate, and kainit. Both plats were on land on which cattle were fed during the winter of 1902–3. On land on which cattle had not been fed the highest yield followed an application of 200 lbs of cotton-seed meal and 100 lbs. of acid phosphate. Cotton planted April 1 gave 278 lbs. per acre as compared with 289 lbs. from that planted April 15, 55 lbs. from that planted May 1, and a total failure in case of that planted May 15.

III. *Results from the Holly Springs Branch Experiment Station*, C. T. Ames (pp. 22–27).—In a variety test at this station the highest yields of lint cotton per acre were given by Truitt 90-day, Broadwell Double Jointed, and Rowden 116. In the fertilizer test the highest yields followed applications of (1) 200 lbs. acid phosphate (2) 100 lbs. each acid phosphate and cotton-seed meal, and (3) 200 lbs. cotton-seed meal, in the order named. Ten applications were tested in this series of experiments and in a parallel series 7 of them were duplicated except that the applications were doubled in amount. In this series much the highest yield followed the application of 200 lbs. each of cotton-seed meal and acid phosphate. These figures are for 1911. Another table states the 6-year average results in which the same applications were followed by the highest yields but with less distinct advantage. In another fertilizer test in 1911 the highest yields followed applications of (1) 200 lbs. of cotton-seed meal and (2) 400 lbs. of raw-rock phosphate. In a test of nitrogen sources supplemented in each case by 200 lbs. of acid phosphate the use of (1) 200 lbs. of cotton-seed meal and (2) 80 lbs. of nitrate of soda gave yields somewhat higher than those secured from the use of 150 lbs. of nitroline or 486 lbs. of ammoline. The soil used has been in cultivation more than 50 years and is characteristic of the poorer soils of the section.

IV. *Results from Delta Branch Experiment Station*, G. B. Walker (pp. 27–29).—The Express and Triumph varieties excelled the others tested in value of lint cotton per acre.

In a spacing test in which the stalks stood from 18 to 24 in. apart in the row, better yields were obtained from rows 3½ ft. apart than from rows 3, 4, 5, or 6 ft. apart.

Note on the present position of cotton investigation in India, B. Coventry (*Agr. Research Inst. Pusa, Bul. 26, 1911, pp. 11*).—A brief survey of the status of cotton planting, fertilizer, and cultural investigations in India.

[Flax experiments in India], E. M. VANDEKERKHOVE (*Agr. Research Inst. Pusa, Bul. 25, 1911, pp. 11, pls. 4*).—This is a brief report of fertilizer and rate of sowing tests of flax at Dooriah during the year 1910–11.

Ragged Jack kale (*Agr. Gaz. N. S. Wales, 23 (1912), No. 2, p. 183*).—Seed sent from the botanical gardens to the Bathurst experiment farm produced plants which ran to seed as soon as planted, presumably because of the lateness of the season. Seed sent to the Glen Innes farm, however, produced succulent plants entirely devoid of woody fiber, but did not equal white chou moellier in quality of green fodder.

Black oats, A. H. E. MCDONALD ET AL (*Dept. Agr. N. S. Wales, Farmers' Bul. 50, 1911, pp. 3–13*).—A discussion of the wild oat (*Avena fatua*), with suggestions on its control and eradication.

Fertilizers and the growth of rice, J. ZAMORA (*Philippine Agr. and Forester, 1 (1911), No. 8, pp. 152–154*).—This article states the result of pot experiments with rice in which the chemically pure salts ammonium nitrate, potassium phosphate, calcium phosphate, magnesium chlorid, magnesium nitrate, and magnesium sulphate were used in molecular solutions. A table states the number of leaves, date of flowering, height of plants, and number of rice grains per plant secured.

Correlation in rye, D. LEHN (*Illus. Landw. Ztg., 32 (1912), No. 3, pp. 13, 14*).—The author presents figures from the records of C. Kraft, who has practiced individual selection from Zeeländer rye for 10 years.

From data for the 4-year period 1908–1911, it appears that the length of haulms varies directly with length of head, number of internodes, weight per head and per 1,000 kernels, and number of kernels per head, while it varies inversely as the weight per plant, the number of haulms, the density of head, the grain weight per plant, and the chaff percentage.

Soy beans, W. F. INGALLS (*Cooperstown, N. Y. [1912], pp. 36, pls. 3*).—This is a brief manual of information for the soy bean grower.

The growth of sugar beet (*Abs. in Jour. Bd. Agr. [London], 18 (1912), No. 11, p. 943*).—In a comparative test of sugar beets and mangels at 6 points in Somerset the yields were 16 and 40 tons per acre, respectively. The beets were left a little closer in the drills. Heavy manurial applications tended to depress the sugar percentage of the beets.

Experiments on the cultivation of sugar cane at the Partabgarh Experimental Station, 1909–1911, G. CLARKE ET AL (*Agr. Research Inst. Pusa, Bul. 27, 1912, pp. 29, pls. 2*).—This is largely made up of tables stating the results of rate of planting tests at the Partabgarh station in India during 1909–1911. The author notes that the sugar canes of upper India differ markedly from those of other countries and demand very different treatment, and that the general conclusions holding good for varieties growing in Java, the West Indies, and southern United States can not always be applied to them.

Sweet potato investigation, T. E. KEITT (*South Carolina Sta. Bul. 165, pp. 43*).—Previous work on the sweet potato by the station (E. S. R., 25, p. 534) is reviewed, and some general information regarding the crop is presented. Determinations of sugar, glucose, and starch, and studies on the formation of sugars and starch and the content of these substances at different times of harvesting are reported, together with descriptions of the different varieties tested, fertilizer and proximate analyses of different varieties, and a report of an additional laundry test of the starch.

Determinations of samples filtered under pressure showed an average of 4.21 per cent, and samples filtered without pressure an average of 4.22 per cent, of sucrose and glucose together. It was found that some changes took place in

the samples as they stood, the indication being the formation of an acid. To prevent this change, for the purpose of obtaining more accurate results, bichlorid of mercury was used as a disinfectant to arrest enzym action and fermentation, but this was also found to interfere with the accuracy of the method.

The study of the formation of the sugars and starch by analyzing samples harvested on different dates showed that on August 28, 1908, in every case, the sucrose was high and the glucose low, that the sucrose decreased and the glucose increased as the time of maturity approached, and that the total sugars and starch both decreased at the time of the most rapid development. Later the starch increased, but the total sugars continued to decrease, the water decreasing at the same time, until September 29 when the sucrose was at its lowest and the glucose generally at its highest.

Similar work was continued in 1909. The results led the author to believe that in the very immature potato the sugar may be present either as glucose or sucrose, probably depending upon the meteorological conditions. It is stated that in 1908 when the 10 days previous to the first digging were wet and cloudy, the sugar was in the form of sucrose, while in 1909 when the 10 days preceding the digging were fair, it was present almost entirely as glucose. The crop of 1908 was grown on a clay loam soil, while the 1909 crop was grown on a sandy soil.

Crop rotation and fertilizer experiments with sun-cured tobacco, W. W. GREEN (*Virginia Sta. Bul. 196, pp. 3–20, figs. 8*).—Earlier reports on these experiments, which are in cooperation with this Department, have already been noted (E. S. R., 22, p. 137).

The results of the crop rotation work led to the recommendation of the following 7-year rotation: Tobacco, wheat, grass, grass, corn with crimson clover as a cover crop, cowpeas, and red clover. The rotation of crops in the sun-cured tobacco district was found necessary and profitable. In connection with this rotation work it was found that seeding grass alone in August gave better results than seeding with small grain.

The fertilizer experiments showed that phosphoric acid was needed most in the soils of the sun-cured tobacco district, and that a complete fertilizer gave the best returns. Potash and nitrogen were unprofitable without phosphoric acid. The use of lime did not respond very perceptibly. Applications of cotton-seed meal made a much finer grade of tobacco than the use of nitrate of soda, but the yield was smaller. Only two-thirds as much nitrogen was found necessary when given in the form of nitrate of soda as when applied as cotton-seed meal. Heavy applications of fertilizer were found to be more profitable than light applications. The use of 1,000 lbs. of 3:8:3 fertilizer per acre gave a profit of $40.29, while 1,300 lbs. of a home-mixed fertilizer gave a profit of $112.17.

Growing and curing sun-cured tobacco, W. W. GREEN (*Virginia Sta. Bul. 197, pp. 3–14, figs. 6*).—Directions for growing and curing sun-cured tobacco accompany a statement of the results of a fertilizer test.

A yield of 580 lbs. of tobacco and a profit of $38.69 followed an application of 1,000 lbs. of a ready-mixed 3:8:3 fertilizer costing $12.50 as compared with 1,110 lbs. and $79.92 after an application of a mixture of 1,500 lbs. cotton-seed meal, 500 lbs. of acid phosphate, and 200 lbs. of sulphate of potash per acre costing $32.41. "This shows more than twice the net returns from the heavy application of home-mixed fertilizer" than were secured after the use of the ready-mixed fertilizer. The following wheat crop also received a marked benefit.

Crop rotation and fertilizer experiments with bright tobacco, R. P. COCKE (*Virginia Sta. Bul. 198, pp. 3–20, figs. 6*).—Results similar to those reported have been previously noted, with descriptions of the experiments (E. S. R., 22, p. 137).

The results here reported indicate the value of using a complete fertilizer for bright tobacco. The value of the crop less the cost of the fertilizer when fertilized with nitrogen, potash, or phosphoric acid alone was $63.43 or less per acre, while it reached $124.54 per acre where a complete application was used. The use of 1,400 lbs. of a 3:8:3 fertilizer per acre gave a net profit of $19.58 more than 800 lbs. of the same fertilizer, and the effects on succeeding crops were more pronounced.

The rotation recommended for 6 years is as follows: Tobacco, wheat, grass, grass, corn with crimson clover as a cover crop, and cowpeas. An average yield of tobacco under this rotation of 1,257 lbs. per acre, having a value of $116.98, was secured. It was found that the use of lime darkened the color of bright tobacco, showed little benefit to corn and wheat, but had a most satisfactory influence on the growth of grass.

Wheat breeding experiments, E. G. MONTGOMERY (*Nebraska Sta. Bul. 125, pp. 5–16, figs. 9*).—A historical sketch of wheat culture and wheat-breeding work in Nebraska is followed by a statement of the results of variety tests at the station and of tests of improved strains by farmers.

Tests of over 100 varieties already noted (E. S. R., 14, p. 36) have indicated only 3 varieties that were capable of surviving Nebraska's very dry winters, and as Turkey Red excelled the other 2 varieties in milling qualities it was evidently most suitable for general cultivation. Attempts to improve it by the importation of new seed from southern Russia or from Alberta, Canada, have given negative results. Selection, however, produced strains which varied in ability to resist lodging and in shape and quantity of grain, as well as in yielding power. A table states results secured during the period 1907–1910 from 26 strains. They varied in yield from 28.88 to 40.75 bu. per acre, but it was difficult to tell by appearance the best from the poorest yielders in the field.

In 1910, 26 8-acre fields of improved strains were sown in 20 different counties of the State. The results reported by 21 experimenters showed average yields of 25.9 bu. of the improved Turkey Red as compared with 21.9 bu. of the locally grown Turkey Red. The 3 strains used in this test were Nos. 287, 425, and 48. "No. 48 has proved to be a very satisfactory yielder in comparison, but was reported as somewhat light in color." A fourth strain, No. 42, which is now ready for distribution "appears to be superior to any of the other varieties so far tested, especially in color and quality."

Is Federation wheat degenerating? J. T. PRIDHAM (*Agr. Gaz. N. S. Wales, 23 (1912), No. 3, pp. 213–215*).—An account is given of the occurrence of 3 mutants in Federation wheat and of the crops secured from them. Inquiry indicated that a number of other variations had been observed in this variety at the different experiment farms.

Twenty five years' plant improvement in Sweden, N. H. NILSSON (*Sveriges Utsädesför. Tidskr., 21 (1911), No. 4, pp. 175–187*).—This is a history and explanation of the organization and work of the Swedish Seed Improvement Society.

HORTICULTURE.

Radium as a means of forcing plants, H. MOLISCH (*Österr. Gart. Ztg., 7 (1912), No. 6, pp. 197–202, figs. 3*).—A summarized account of the author's experiments in the use of radium chlorid and radium emanation in forcing plants.

During the latter part of November lilac branches were successfully forced out by attaching pipettes containing a small quantity of radium chlorid to the terminal buds. The forcing effect was irregular, however, since the individual buds were situated at different distances from the radiating area. Lilac branches exposed to radium emanation for periods of 20, 48, and 72 hours were successfully forced, the longer exposure giving the quicker results. Similar results were secured with chestnut branches, except that exposure to emanation for a day appeared to be sufficient. Tests were also made with branches of a number of other trees. The tulip, bladdernut, and maple were successfully forced, whereas the ginkgo, sycamore, red beech, and linden gave negative results. The experiments indicate that radium emanation will only stimulate growth during that part of the rest period between the middle of November and the end of December.

New garden plants of the year 1911 (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., 1912, App. 3, pp. 39-64*).—A list is given of garden plants described in botanical and horticultural publications during 1911. It comprises all the new introductions recorded, together with the most noteworthy of those which have been reintroduced after being lost from cultivation.

Report of the division of horticulture of the Central Agricultural Station for the year 1911, M. CALVINO (*Estac. Agr. Cent. [Mexico] Bol. 66, 1912, pp. 82, pls. 74*).—This comprises a report of varietal, climatal, and cultural experiments with forage crops, fruits, rubber trees, vegetables, ornamentals, and cereals conducted at the Central Agricultural Station.

Home gardening in South Carolina, C. C. NEWMAN (*South Carolina Sta. Bul. 166, pp. 3–48, figs. 6*).—A popular treatise presenting general considerations relative to soil and plant classification, how plants feed and grow, crop rotation, cultivation, fertilizers, hotbeds and cold frames, and giving specific directions for the culture of the important vegetables. Directions are given for controlling the more troublesome insects and fungus diseases, together with planting tables and varieties of vegetables recommended for the home garden in South Carolina.

Growing Denia onion seed, F. GARCÍA (*New Mexico Sta. Bul. 82, pp. 27, figs. 8*).—In a previous bulletin (E. S. R., 22, p. 732) it was shown that the Spanish or Denia onion is well adapted for culture in certain parts of New Mexico.

Successful experiments in the production of a home supply of Denia onion seed are here reported. The seed was produced at the rate of 525 lbs. per acre in 1910 and 430 lbs. per acre in 1911. The germination tests showed 89 per cent and 81 per cent for the 2 years, respectively. The onions raised from the home-grown seed compare favorably with those from imported seed.

Impediments to the vegetable industry and their control, J. KINDSHOVEN (*Flugschr. Deut. Landw. Gesell., 1912, No. 13, pp. 26*).—This comprises a popular treatise on the control of plant diseases, animal pests, and other drawbacks to successful vegetable growing.

Pomology (*9. Cong. Internat. Agr. Madrid, 1911, pp. 639–715*).—This comprises reports of papers presented and discussed in the pomological section of the Ninth International Congress of Agriculture, Madrid, in 1911, as follows: The Culture of Oranges, Olives, and Other Important Fruit Trees, by J. M. P. Jaramillo; a report on the same theme, by Janini; Suggestive Improvements in the Culture of Olives and the Manufacture of Olive Oil, by J. Chapelle; Methods of Defense against the Parasites and Principal Diseases of Fruit Trees, by L. Navarro; reports on the same theme, by L. Salas Amat and R. Janini; Recent Progress in the United States against Insects Destructive to Oranges, by C. L. Marlatt; and The Ink Disease in Chestnut Groves at Ardèche, by J. Farcy.

Fruit culture, R. GOETHE (*Obstbau. Berlin, 1910, pp. 174, pls. 30, figs. 77*).—A practical treatise on fruit growing with special reference to German conditions.

How to grow and market fruit (*Berlin, Md. [1912], pp. 131, pls. 24*).—A practical treatise on fruit culture and marketing.

The California fruits and how to grow them, E. J. WICKSON (*San Francisco, Cal., 1912, 6. ed., rev., pp. 602, figs. 181*).—The present edition of this treatise (E. R. S., 22, p. 734) has been revised with a view to including recent progress in various phases of the fruit industry.

Experiments on the pollination of our hardy fruits, C. H. HOOPER (*Irish Gard., 7 (1912), Nos. 76, pp. 83, 84; 77, pp. 102, 103*).—A summarized account of this work has been previously noted (E. S. R., 25, p. 838).

Orchard heating, L. GREENE (*Iowa Sta. Bul. 129, pp. 131–164, figs. 16*).—This bulletin reports tests conducted by the station in 3 different orchards during the season of 1911 to determine the value and efficiency of some of the orchard heating devices now on the market. Reports from individual growers in various sections of the State, who also tried out heating devices, are included and general information is given relative to methods of heating orchards.

The spring of 1911 did not offer the best conditions for a thorough test because injurious temperatures did not occur.

How a Ventura lemon grove was protected, C. A. TEAGUE (*Pacific Rural Press, 83 (1912), No. 26, pp. 604, 605*).—A detailed statement is given of frost fighting experience during the past season in a California lemon grove.

New heater and vaporizer for frost protection, A. G. MCADIE (*Mo. Weather Rev., 40 (1912), No. 4, pp. 618, 619*).—A new heater and vaporizer being tried at the San Francisco office of the Weather Bureau is here described.

Temperatures injurious to peaches, apples, and pears in various stages of development (*Mo. Weather Rev., 40 (1912), No. 3, p. 426*).—This comprises data collected under the direction of the Fruit Growers' Association of the Grand Valley, Colo., with the view of assisting growers in frost protection work.

Tests of summer sprays on apples, peaches, etc., G. P. CLINTON and W. E. BRITTON (*Connecticut State Sta. Rpt. 1911, pt. 5, pp. 347–406, pls. 8*).—Tests of various Bordeaux, lime-sulphur, and miscellaneous sulphur mixtures (E. S. R., 24, p. 553) were continued on an extended scale in 1911. Lead arsenate was used, both with the mixtures and alone, as an insecticide. The details of the year's work with apples, peaches, pears, quinces, plums, cherries, and currants are reported and the results of the 2 years' work with apples and peaches are reviewed. With the results secured in the above experiments as a basis recommendations are given as to spraying practice for these fruits.

In these experiments Bordeaux has on the whole shown the best fungicidal value of any of the sprays tried. In the work with apples it was found that 3 sprayings having lead arsenate in the last 2 keep most of the fungi and insects under control. In the control of black rot on the leaves complete removal of the diseased branches should be combined with spraying. The prevention of rust requires a continuous coating of the leaves from the time they first appear until all danger of infection from the cedar apple stage is over. To reduce the russeting or burning of apples that occurs with Bordeaux used alone, the authors advise using the 4:4:50 formula in the first spraying before the blossoms have opened at the critical time for scab. In the second and third spraying a 1:4:50 formula may be used. Compared with the commercial lime-sulphur sprays, however, even weak Bordeaux is apt to produce more russeting on such susceptible varieties as Baldwin and Greening. The authors are not yet prepared to recommend a substitution of lime-sulphur solutions for Bordeaux

on those varieties not seriously liable to russeting or on those very susceptible to fungus attack. The varieties which were found to be either immune or susceptible to scab, rust, sooty blotch, fruit specks, and rot are indicated. Taking all things into consideration, including the difficulty of making self-boiled lime-sulphur, this mixture appears to have no special advantage over the commercial lime-sulphurs as a fungicide for apples.

When commercial lime-sulphur is substituted for Bordeaux it should be used at the rate of 1¼ gal. per 50 gal. of water for all 3 sprayings. For the insecticide lead arsenate at the rate of 3 lbs. of paste or 1½ lbs. of powder per 50 gal. of mixture may be added in the last 2 sprayings. The treatment recommended for the pear and quince is similar to that for the apple. For peaches, cherries, and plums, where there is always danger of burning from Bordeaux and also often from commercial lime-sulphurs, especially if used with lead arsenate, self-boiled lime-sulphur appears to be the best fungicide since it produces on the whole the least injury of any spray tried. The 8:8:50 formula for all 3 sprayings has given the best results.

In the 2 years' work with peaches lead arsenate has done little to prevent the attacks of curculio, and since it seems to increase the danger of spray injury when combined with lime-sulphur, the authors advise leaving it out unless there is considerable danger from sawfly injury, when it can be added in the second spraying as with apples.

Orchard spraying experiments, W. W. Bonns (*Maine Sta. Bul. 198, pp. 32, pls. 5*).—Spraying experiments were continued at the Highmoor Farm in 1911 (E. S. R., 25, p. 538), and cooperative experiments were conducted in 3 nearby orchards. The formulas used in the Highmoor experiments included lead arsenate at the rates of 2 lbs. and 4 lbs. to 50 gal. of water, lime-sulphur at the rates of 1¼, 1⅝, and 2 lbs. to 50 gal. of water, plus 2 lbs. of lead arsenate in each case, and Bordeaux mixture 3:3:50 plus 2 lbs. of lead arsenate. The results are presented in detail and discussed.

Seasonal conditions combined with other inhibitive factors were unfavorable for the development of fungus and insect injury to any practical degree, hence no valuable data for estimating the fungicidal or insecticidal value of the sprays were secured. In the case of fruit russeting none of the percentages from any plats were high and all so nearly alike that no deductions are warranted. The relation of lime-sulphur injury to strength of solution was not indicated in any way.

In view of observations made in 1911 the author is now inclined to the opinion that calyx injury, which was found quite generally on fruit sprayed with lime-sulphur in 1910, may be due as much to lack of vigor in the tree as indicated by the tissues of the fruit, as to the caustic action of the spray.

A form of injury known as sunscald was produced by sunlight on fruit directly exposed to the sun upon the southern sides of trees. The sunscald appeared as discolored sunken spots or maculations with a sharply defined margin. Spraying during hot weather appeared to increase the severity of sunscald where injured areas were present before the last spray was applied. Also the amount of scald, though relatively small, varied directly with the strength of lime-sulphur used. Injury on the lead-arsenate plats was less in amount but qualitatively equally serious. Scald injury on the Bordeaux plats was very slight.

Aside from fruit russeting a large percentage of the apples on the Bordeaux plat showed more or less Bordeaux injury, the fruit appearing to be either well mottled with dull-brown flecks a few millimeters in diameter or speckled with minute dots. This gave to the fruit a general soiled dull-brown hue. The coloring of the fruit from this plat was far below that of the apples on any of

the others, whereas the fruit of the other experimental plats, benefited by the rains of late summer and the long period of sunshine, grew to unusual size and was of exceptionally high quality and color. The development of Bordeaux injury appears to have coincided with a period of rainy weather.

From the results of the experiments as a whole the author concludes that spray injury may be, and very likely is, due as much to a physical factor, i. e., the application of a mist or spray to growing plant tissues under extreme, or some now undetermined, but unfavorable, meteorological conditions, as to any chemical action of the material used.

Analyses of materials sold as insecticides and fungicides (*New York State Sta. Bul. 348, pp. 85–98*).—Analyses are reported of Paris green, lead arsenate, Bordeaux lead arsenate, Bordeaux mixture, Bordeaux-Paris green mixtures, lime-sulphur solutions, mixtures of soluble sulphur and oils, nicotin preparations, soap solutions, sulphur, and hellebore.

The precooling of fruit in the United States, S. J. Dennis (*Ber. II. Internat. Kältenkong. Wien, 2 (1910), pp. 434–456, figs. 8*).—A paper on this subject read before the Second International Refrigeration Congress, held at Vienna in 1910.

Refrigeration in relation to fruit growing in Canada, J. A. Ruddick (*Ann. Rpt. Fruit Growers' Assoc. Nova Scotia, 48 (1912), pp. 33–42*).—In this paper the author points out some of the possibilities of cold storage in relation to the fruit industry.

Breeding citrus trees, A. D. Shamel (*Pacific Rural Press, 83 (1912), No. 25, p. 580*).—An abstract of a paper read before the California State Fruit Growers' Convention at Santa Barbara.

In his study of bud selection with citrus fruits (E. S. R., 24, p. 737), the author finds frequent variation in type of tree and fruit such as would come under the heading of bud sports or so-called bud mutation. A study of one grove of Washington navel oranges of about 150 acres revealed the presence of 7 frequently occurring types, 5 of which are unproductive, bearing low-grade undesirable and unprofitable fruit. All of the trees of this grove were propagated from the 2 parent Washington navel trees in Riverside. Similar variations were found in grapefruit and lemons. The frequency and general prevalence of bud sports in the Valencia orange is much greater than in any citrus variety yet studied.

The trees have been found to vary consistently, not only in striking typical differences, but in the amount of production within the type. About 10 per cent of standard type trees studied are consistent producers of the highest grades of fruit and free from any evidence of bud sports. The author calls attention to the successful results secured by G. T. Powell from the practice of careful bud selection (E. S. R., 19, p. 1142), and offers a general conclusion that a careful study of bud variation and bud selection will prove of great benefit to the growers of all plants propagated by budding.

Work for citrus improvement, J. E. Coit (*Pacific Rural Press, 84 (1912), No. 1, pp. 5, 6*).—This comprises a brief sketch of the plan of development of the work of the California Citrus Substation.

Viticulture (*9. Cong. Internat. Agr. Madrid, 1911, pp. 587–637*).—This comprises the following papers presented and discussed in the viticultural section of the Ninth International Congress of Agriculture, Madrid, 1911: Grape Stocks Best Adapted to Dry and Limy Soils, by N. García de los Salmones (E. S. R., 27, p. 145); The Grape Stocks in Dry and Limy Soils, by P. Gervais; and New Phases in the Utilization of Musts and Wines, by C. Mestre Artiga.

[Report of the viticultural branch], M. Blunno (*Rpt. Dept. Agr. N. S. Wales, 1911, pp. 60–64*).—This report is largely a review of the work of recon-

stituting phylloxera-infested vineyards with resistant stocks, together with a review of the 1911 vintage and enochemical analysis.

A new process of grafting American grapes, P. BUNERT (*Möllers Deut. Gärt. Ztg., 27 (1912), No 24, pp. 277, 278, figs. 2*).—The method described consists of the use of a plaster of Paris bandage around the union and rooting the grafted cuttings without artificial heat.

Making a rock garden, H. S. ADAMS (*New York, 1912, pp. 52, pls. 8, figs. 6*).—A short treatise on the details of constructing and plant materials for rock, wall, water, and bog gardens.

Making a garden to bloom this year, GRACE TABOR (*New York, 1912, pp. 54, pls. 8, fig. 1*).—A popular discussion of plant material for quick effects.

FORESTRY.

Illustrated key to the wild and commonly cultivated trees of the northeastern United States and adjacent Canada, based primarily upon leaf characters, J. F. COLLINS and H. W. PRESTON (*New York, 1912, pp. VII+184, figs. 279*).—The authors' Key to New England Trees (E. S. R., 21, p. 241) has been extended in the present handbook to include the northeastern States and adjacent Canada. Illustrations showing an outline of a typical leaf of every tree of which the leaves differ sufficiently to be easily recognized have also been included.

Key to the wild and cultivated trees in autumn, C. A. DARLING (*Torreya, 12 (1912), No. 7, pp. 155–164*).—This key is designed to be used in the field to determine the trees to be found growing in the eastern United States.

The seedlings of the live oak and white oak, W. C. COKER (*Jour. Elisha Mitchell Sci. Soc., 28 (1912), No. 1, pp. 34–41, pls. 2*).—A comparative study of the seedling structure of live and white oaks, with special reference to the tuberous formations of the roots of live oak seedlings.

Tulipwoods and tulip trees, W. DALLIMORE (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., 1912, No. 5, pp. 241–245*).—Descriptive accounts are given of a number of woods which are commonly classed as tulipwood.

Eucalyptus, its history, growth, and utilization, C. H. SELLERS (*Sacramento, Cal., 1910, pp. 93, figs. 35*).—This is a treatise on eucalyptus culture, based largely on data secured from various groves in California. Information is given relative to the soil and climatic requirements, adaptability of species for given localities, time and method of planting, and subsequent care and management. Considerable data are also given relative to the rate of growth, yield, and utilization of the different species.

Camphor from Cinnamomum camphora; cultivation and preparation in the Federated Malay States, B. J. EATON (*Dept. Agr. Fed. Malay States Bul. 15, 1912, pp. 38, pl. 1*).—In addition to a description of the experiments carried out in the Federated Malay States Agricultural Department, a summary is given of experiments conducted in other countries, together with a résumé of the present condition of the industry.

[Rubber tapping experiments], H. NEWPORT (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1909–10, pp. 67–74*).—This comprises a detailed statement of experiments in tapping Para rubber, together with estimates of the cost of establishing, upkeep, and the profits to be derived from a Para rubber plantation.

The woodlot for central Indiana, E. C. PEGG and M. B. THOMAS (*Proc. Ind. Acad. Sci., 1909, pp. 419–439, figs. 4*).—This paper describes the condition of central Indiana woodlots and makes suggestions for their improvement and perpetuation.

Wood-using industries and National Forests of Arkansas (*U. S. Dept. Agr., Forest Serv. Bul. 106, pp. 40*).—This is a 2-part bulletin dealing with the forest products and resources of Arkansas.

Part I. *Uses and supply of wood in Arkansas*, J. T. Harris and H. Maxwell (pp. 7–26).—This comprises a statistical account of that part of the sawmill output which passes through further processes of manufacture in the State. Tabular data are given showing the amount of such wood consumed annually in Arkansas by species and industries, together with the cost and the percentage grown in and out of the State. The various woods included are briefly described.

Part II. *Timber resources of the National Forests in Arkansas*, F. Kiefer (pp. 27–36).—This describes the various kinds of timber on the National Forests and the means of purchasing it.

Grades and specifications of rough stock and squares employed in making special hardwood products for factory use, together with a summary of uses of wood by Arkansas manufacturers are appended to the bulletin.

Forest products of Canada, 1911.—Pulpwood, H. R. MacMillan, E. G. McDougall, and W. G. H. Boyce (*Dept. Int. Canada, Forestry Branch Bul. 30, 1912, pp. 17, figs. 3*).—A statistical account of the quantity and value of the pulp wood produced in Canada, reported by species, Provinces, and processes. Data are also given showing the pulp exported from the Dominion, together with the pulp wood exported from the various Provinces in a manufactured state. The 54 firms reporting used 672,288 cords in 1911 and 847,939 cords were exported in the raw state.

Strength tests of cross-arms, T. R. C. Wilson (*U. S. Dept. Agr., Forest Serv. Circ. 204, pp. 15, figs. 2*).—This circular describes tests of Douglas fir, shortleaf pine, longleaf pine, and southern white cedar cross-arms, conducted at the Forest Products Laboratory, Madison, Wis.

The average maximum load borne by the various species and grades ranged from 10,180 lbs. for longleaf pine with 75 per cent heartwood to 5,200 lbs. for white cedar, the weakest wood used. Inasmuch as the poles have not withstood an average side pull of much more than 3,000 lbs., all of the woods tested are considered sufficiently strong to be used for cross-arms.

The preservation of mine timbers, E. W. Peters (*U. S. Dept. Agr., Forest Serv. Bul. 107, pp. 27, pls. 4, figs. 7*).—Experiments conducted cooperatively by the Forest Service and various mining companies throughout the United States to secure authentic data on the efficiency of various methods of preserving mine timbers from decay, in continuation of previous work (E. S. R., 19, p. 545), are here reported. The work is discussed under the general headings of agencies destructive to mine timbers, practical methods of increasing the durability of timber, results of experimental treatments, cost of treatment, durability of treated timbers, economy in the use of treated timber, and the avoidance of waste. Analyses of preservatives are appended.

Decay was found to be the agency most destructive to timber used in mines. Although this may often be retarded by peeling and seasoning, treatment with a suitable preservative is more effective. Mine timbers impregnated with zinc chlorid and creosote oils have shown the best results. Green, unpeeled, and untreated loblolly pine gangway sets lasted less than 1½ years. Brush treatments with creosote and carbolineum increased the average life about 3 or 4 years, while impregnation treatments with zinc chlorid and creosote left from 70 to 90 per cent of the timbers sound at the end of 4 years. Either the brush treatment, the open tank process, or the pressure process may be used in treating mine timbers, the method employed depending on the amount of material to be treated.

Silviculture (*9. Cong. Internat. Agr. Madrid, 1911, pp. 507–586*).—This comprises the following papers on reforestation presented and discussed in the silvicultural section of the Ninth International Congress of Agriculture, Madrid, 1911: Reforestation, Its Advantages and Methods Affecting It, by C. de Camps; Reforestation, by Daubrée; The Problem of Reforestation in the Mediterranean Basin, by R. Hickel; Value of Reforestation and Methods of Accomplishing It, by P. Descombes; The Work of Official Corporations, Societies, and Individuals in Connection with Reforestation in Spain, by R. Codorniú; Principles of Reforestation in Denmark, by C. Dalgas; Value of Reforestation and Methods of Accomplishing It, by A. Mendès d'Almeida; Reforestation, by M. L. de Vilmorin; and Protection and Surveillance of Trees, by Fuensanta de Palma.

On the influence of various degrees of light and extreme temperatures upon the germination of forest seed, G. Pittauer (*Centbl. Gesam. Forstw., 38 (1912), Nos. 4, pp. 157–172; 5, pp. 213–224, figs. 2*).—Experiments conducted with spruce, larch, white, black, and Weymouth pine, locust, and red beech seeds are reported in detail.

The selection strip-felling and its system, C. Wagner (*Der Blendersaumschlag und sein System. Tübingen, 1912, pp. XII+368, pls. 2, figs. 73*).—A treatise on forestry in which the author sets forth a system of forest management based on the selection strip method of felling discussed in his previous work, The Principles of Spacial Arrangements in Forests (E. S. R., 20, p. 645).

The lightning danger of various trees, E. Stahl (*Die Blitzgefährdung der Verschiedenen Baumarten. Jena, 1912, pp. 75*).—This comprises an examination of both scientific and popular literature dealing with the value of various tree species as lightning conductors.

Summing up the evidence as a whole it does not appear that trees are of material value as lightning conductors near buildings or that they are sufficiently dangerous to be abolished from the vicinity of a building. A comparative study of the characteristics of those trees which have been reported most dangerous and those which have been reported least dangerous shows a tendency for certain trees to become quickly wet from top to bottom during an ordinary thunder shower. To this class of trees, which forms the best lightning conductors, belong the apple, cherry, nut trees, beeches, horse chestnut, hornbeam, maple, and sycamore. The greatest loss of life and damage to property has been caused by such trees as spruce, firs, larches, poplars, willows, elms, linden, ash, pear tree, and oaks.

Forest fire protection under the Weeks law in cooperation with States, J. G. Peters (*U. S. Dept. Agr., Forest Serv. Circ. 205, pp. 15, fig. 1*).—This circular explains the nature of the aid rendered by the Forest Service of this Department under section 2 of the Weeks law (E. S. R., 24, p. 498), which section authorizes the Secretary of Agriculture to cooperate with States in protecting from fire the forested watersheds of navigable streams.

A review is given of the work done in 1911, together with the results accomplished. The form of agreement for cooperative work, together with a sample fire plan map of the northern district of New Hampshire, is appended.

Eighth annual report of the state forester of Massachusetts, F. W. Rane (*Ann. Rpt. State Forester Mass., 8 (1911), pp. 154, pls. 8, figs. 3*).—Introductory considerations deal with the organization and staff of the forestry department. Part 1 reviews the general forest operations for the year, including the examinations of woodland and assistance rendered to owners, reforestation and forest nursery work, forest fires and methods of control, progress of the chestnut bark disease in Massachusetts, a sketch showing a proposed cure for the lumbering slash evil, numerous addresses and lectures delivered by the state for-

esier, and new forestry legislation, together with a financial statement for the year. A state-wide forest fire organization, headed by a state warden, was perfected during the year.

Part 2 of this report, which records the year's progress in the suppression of the gipsy and brown-tail moths, is noted on page 455 of this issue.

Progress report of forest administration in the Andamans for 1910–11, H. A. FARRINGTON (*Rpt. Forest Admin. Andamans, 1910–11, pp. IV+34*).—This comprises a review of the administration of the state forests of the Andamans, including a financial statement for the year 1910–11. The more important data relative to areas, surveys, protection and miscellaneous forest work, revenues, expenditures, etc., are given in appendixes.

DISEASES OF PLANTS.

Four new fungus diseases in Iowa, L. H. PAMMEL and CHARLOTTE M. KING (*Iowa Sta. Bul. 131, pp. 199–221, figs. 14*).—Notes are given on timothy rust (*Puccinia phlei-pratensis*), alfalfa rust (*Uromyces striatus*), blister canker of the apple (*Nummularia discreta*), and onion smut (*Urocystis cepulæ*). The different fungi and their methods of attack are described, and accounts are given on the distribution of the diseases and the relation of the fungus to the host plant, together with suggestions for their control. A bibliography is appended.

Notes on fungus diseases, J. C. MOORE (*Rpts. Bot. Sta. [etc.] St. Lucia, 1910–11, pp. 6, 7*).—Brief accounts are given of diseases affecting a number of economic plants, among them the root disease, which attacks cacao, breadfruit, avocados, and other trees; the pink disease of guavas, due to a fungus which has been identified as *Corticium lævc;* and a fungus disease of lime branches, which is caused by attacks of *Thelephora pedicellata.*

Fungi exotici: XIII, G. MASSEE (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., 1912, No. 4, pp. 189–191*).—The author describes a number of species of fungi, two of which are considered to be injurious parasites. These are *Pheangella heveæ*, which is found on the bark of the young Hevea rubber trees in Southern Nigeria, and *Colletotrichum necator*, which is said to cause the fruit of peppers to become blackened and shriveled. Technical descriptions of the different species are given.

The seed treatment of summer grains, L. HILTNER (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 10 (1912), No. 2–3, pp. 23–26*).—The author recommends treating oats, barley, and wheat with a 0.1 per cent solution of formalin for the prevention of loose smut of oats, stinking smut of wheat, and barley smut due to *Ustilago hordei.* Other efficient treatments recommended are the use of Sublimoform and Cuproform, combinations of corrosive sublimate and formalin and copper sulphate and formalin. For the treatment of rye a weak solution of corrosive sublimate is preferred. For combating loose smut of wheat and barley chemical treatments can not be recommended, but the modified hot-water treatment is said to be very efficient.

Control of grain smuts, JOHANNA WESTERDIJK (*Cultura, 23 (1911), No. 280, pp. 558–598*).—This is a discussion of the present state of the information regarding combating of smut in grains, and of the recent literature on the subject. Attention is given more particularly to the contributions of O. Appel and E. Rheim (E. S. R., 26, p. 546) on the treatment with hot air and hot water under conditions claimed by them to produce the best results. The author states that this treatment has already been successfully employed in the Netherlands.

Cotton anthracnose, H. W. Barre (*South Carolina Sta. Circ. 1, pp. 3*).—This circular gives a survey of the situation in South Carolina in relation to the cotton anthracnose, describes the symptoms of the disease and methods for combating it, and requests information from planters in relation to various factors of distribution and control.

Cotton anthracnose, H. W. Barre (*South Carolina Sta. Bul. 164, pp. 22, pl. 1, figs. 6*).—The author has for a number of years been conducting investigations on cotton anthracnose, the technical results of which have been published in the reports of the station (E. S. R., 26, p. 647). The present bulletin brings together in a nontechnical form the information gained to date. The author shows that the disease is spread principally by infected seed and that the fungus retains its vitality in diseased seed for probably 2 years or more. In the field the fungus does not remain alive for more than 1 year. It is claimed that crop rotation and seed selection will control this disease, which is widely spread and very destructive.

Investigations on potato diseases (third report), G. H. Pethybridge (*Dept. Agr. and Tech. Instr. Ireland Jour., 12 (1912), No. 2, pp. 334–359, pls. 3*).—This report gives an account of further studies on various diseases of the potato and means for their control (E. S. R., 25, p. 454). Among the diseases investigated were the ordinary potato blight, sclerotium disease, black stalk rot, corky or powdery scab, leaf curl, leaf roll, sprain, and a new form of potato rot.

In spraying experiments for the potato blight, due to *Phytophthora infestans*, Burgundy mixture, Bordeaux mixture, and lime-sulphur solution were compared. On account of the difficulty of obtaining good lime the Burgundy mixture is given preference over Bordeaux mixture. The lime-sulphur solution was found practically useless in warding off potato blight.

For the sclerotium disease, due to *Sclerotinia sclerotiorum*, no efficient method of treatment has been found, though spraying and cultural methods were tested.

The effect of heating tubers infected with the organism of the black stalk disease (*Bacillus melanogenes*) for 4 hours at 50° C. was tested but without any striking results. When the tubers were subjected to lower temperatures the rot seemed to be accentuated.

The author definitely establishes the fact that *Spongospora subterranea*, the cause of the corky or powdery scab, produces galls on the roots of the potato plant. Soil fungicides were found to reduce the injury due to this organism.

Attention is called to the differences between leaf curl and leaf roll of the potato.

A new tuber rot was investigated which the author states can not be classed as a wet or a dry rot, as it does not exhibit the characteristics of either. The disease occurs in a number of regions in Ireland. It attacks the larger tubers and may cause serious losses in the crop. A study of material demonstrated that it was not due to bacteria, while a fungus was isolated from some of the diseased tubers which is believed to be the cause of the rot. The fungus resembles *P. omnivora*. This form of tuber rot is to be investigated further.

The Alternaria blight of ginseng, H. H. Whetzel (*Spec. Crops, n. ser., 11 (1912), No. 117, pp. 91–95*).—The Alternaria blight, due to *A. panax*, is said to be the most common, widespread, and best known disease of ginseng. It is reported as occurring quite widely throughout the United States, practically in every region where the plant is grown. The symptoms of the disease and the life history of the parasite are described at some length and suggestions given for its control.

According to the author, great care should be exercised to exclude the fungus from the ginseng garden, as its eradication after once becoming established is

practically impossible. The use of a 3:3:50 Bordeaux mixture has proved beneficial both in laboratory tests and when sprayed upon plants. Lime sulphur, which has been tested as a possible substitute for Bordeaux mixture, appeared to be injurious when applied at a strength sufficient to kill the spores of the fungus.

Leaf-roll disease of potatoes, IV, O. Reitmair (*Ztschr. Landw. Versuchsw. Österr., 15 (1912), No. 1, pp. 1–106*).—This is the fourth report by the committee on the study of this disease (E. S. R., 27, p. 351), the principal conclusions in which are as follows:

The primary potato leaf-roll disease entails on the plants alterations which affect both plant and tuber, and tend toward a rapid deterioration of the stock. This deterioration through successive generations is accelerated by unfavorable life conditions, but it may be checked or for a time reversed in part by very favorable treatment, the plants meanwhile showing improvement as regards plant development and crop production. Deterioration under favorable conditions is very gradual, but the investigators are not able to report any means of permanently checking the advance of the disease when once established. The question as to whether plants descended from those showing the primary stage of leaf-roll disease are more susceptible to new disease influences is regarded as still unsettled.

The outward indications of deterioration show in varying degree with different varieties of potatoes. Among the sorts now common Magnum Bonum seems to most readily acquire this disease. With this variety the investigators were unable even by selection to check the decline of the stock.

The size of the tubers is said to be no criterion of freedom from this disease or of desirability in other respects for seeding purposes.

Observations do not appear to bear out the assumption that inheritance of the disease through the tubers is due to an organism. It appears that along with one primary stage two secondary stages occur, viz, a fungus-free stage resulting from simple inheritance and a fungus-bearing form due to repeated infection. The authors were not able by any treatment of the potatoes to produce therein the characteristic symptoms of the leaf-roll disease.

Leaf roll of potato, G. Köck and K. Kornauth (*Ztschr. Landw. Versuchsw. Österr., 15 (1912), No. 3, pp. 179–247, fig. 1*).—This is the fifth report of the committee (see above) and includes studies carried on by the authors for about 3 years on different varieties of potatoes.

Potato leaf roll is held to be a parasitic disease, apparently caused by a fungus of the genus Fusarium. This vegetates in the plant attacked, causing the first stage of the disease. Early in its course this fungus may pass into the newly formed tubers or else, through its weakening influence on the aerial portions of the plant, simply produce a crop diminished in size and number of tubers. Subsequent crops produced from these infected or simply lightened or weakened potatoes will show the fungus-bearing or the fungus-free forms, respectively, of the secondary stage of the disease. It was not found practicable to estimate the intensity of the infection with any accuracy from the effect on the crop.

The variety Magnum Bonum is said to be very susceptible to the disease, and the deterioration through the successive generations was in this case exceptionally rapid. However, it is considered not to have been conclusively shown that careful selection and favorable treatment on uninfected soil may not check the decline and even show actual improvement.

An important rôle is thought to be played by the soil in the transmission of this disease from the old to the new plants. The question as to the duration of the danger period as regards soil infection and that as to the possibility of limiting or preventing such infection are regarded as still unsettled.

The authors append to this report of their own investigations brief abstracts of a long list of contributions made by others on the subject of potato leaf-roll disease in 1911.

Experiments with Bordeaux mixture as a cane dip, A. H. ROSENFELD (*Internat. Sugar Jour., 14 (1912), No. 161, pp. 255–263*).—The author describes experiments in dipping sugar cane in Bordeaux mixture for the prevention of diseases, and also the effect of the fungicide on the germination and growth of the plants. The experiments were divided into 2 series in which normal strength and double strength Bordeaux mixture was used, one lot of seed cane in each series being left in the solution for 1 hour and the other lot soaked for 24 hours. The cane was planted and observations made on its germination and subsequent growth from time to time.

Inspection showed that cane which had been dipped for 1 hour in the Bordeaux mixture gave better results than the untreated lot, while that which had been soaked for 24 hours in the fungicide gave yields less than the checks. The smallest number of stalks per row was obtained from the lot dipped for 24 hours in double strength Bordeaux mixture.

Fruit trees and black spot canker, J. F. CARPENTER (*Brit. Columbia Dept. Agr. Bul. 34, 1911, pp. 14, figs. 5*).—This disease, known also under the names anthracnose, sour sap, etc., in British Columbia since 1901 and in neighboring portions of the United States 10 years earlier, is here described, and the comparative susceptibility of several varieties of trees is discussed.

The disease is said to be due to a parasitic fungus, called *Macrophoma curvispora* by Peck and *Glœosporium malicorticis* by Cordley. Spore-bearing pustules on the surface mark the course but not the full progress of the disease. The fungus may enter apparently without previous breaches in the bark, but is favored by such injury and spreads in the cambium layer and later in the bark to a corresponding extent, producing broad, deep, and sometimes incurable wounds, sapping the vitality of the trees, killing branches, stunting growth, and materially decreasing crop returns. The spores are contained in a gelatinous mass which dissolves in water, permitting their escape, but not to any very great extent until wet weather furnishes favorable conditions, usually after the appearance of the autumn rains. It seems that infection occurs most freely during November and December.

For control of this disease, comparative dryness and freedom from injury are desirable. Proper elevation, drainage, spacing, pruning, and care in cultivation are insisted upon. To prevent infection of the trees by spores when present, Bordeaux mixture or lime-sulphur wash is recommended. The spraying should be done once early in the fall before the rains set in, and repeated just after the fall of the leaves.

A new canker-producing fungus, A. POTEBNIA (*Ztschr. Pflanzenkrank., 22 (1912), No. 3, pp. 129–148, pls. 3*).—A disease of *Pyrus paradisiaca* was investigated by the author and by him attributed to the activity of a fungus formerly known under the name *Phacidium discolor* but by the author classed as a new genus and named *Phacidiella discolor*. A detailed discussion is given of the forms, habits, relationships, and ravages of this fungus, which is found on both dry and living twigs of several species of Pyrus, having been noted at Kharkof, Russia, and at Liege, Belgium.

Diseases of raspberry and loganberry (*Jour. Bd. Agr. [London], 19 (1912), No. 2, pp. 124–126, pl. 1*).—A description is given of *Hendersonia rubi*, which is responsible for serious injury to raspberries and loganberries, and *Ascochyta pallor*, which occurs as a parasite of raspberries, roses, etc.

The first fungus attacks the stems during the summer when the young growth is tender, and as a rule lurid red or purplish patches appear on the stem.

When several diseased areas are present the canes are killed outright during the winter, whereas when only one or two infected areas are present the canes may survive and produce a certain amount of fruit. Infection mostly takes place during the fruiting period, hence spraying can not be successfully resorted to unless the fruit is sacrificed. If spraying is found desirable the use of Bordeaux mixture is recommended. All diseased canes should be cut out and burned as soon as noticed, and the practice of allowing dead canes to remain standing throughout the winter is condemned.

The second fungus forms white patches on the stems, studded with black dot-like fruits. For the control of this parasite, treatment similar to that suggested for *H. rubi* is recommended.

Invasions of downy mildew in southwest France in 1911, J. Capus (*Rev. Vit., 37 (1912), No. 958, pp. 568–571*).—A detailed account is given of the author's observations made on the 7 outbreaks and the progress of grape mildew in the vineyards of Gironde from June to September, 1911.

Conditions for development of downy mildew.—Temperature, L. Ravaz and G. Verge (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 33 (1912), No. 16, pp. 485–488*).—The authors report on a continuation of their studies (E. S. R., 27, p. 49).

Both young and mature leaves of grapes were inoculated at from 7 to 14° C. with spores in a very moist atmosphere, the controls ranging from 18 to 35°. It was found that the inoculations at temperatures down to 8° showed conidiophores in from 4 to 5 days, but those at 7° failed to develop the infection.

Experiments to determine the danger period from possible infection were also carried out under varied conditions. Conidia on glass plates in a very moist atmosphere under bell jars at from 17 to 27° failed to germinate, as did all of those placed in water. Those placed on the upper surface of leaves, kept at from 15 to 32° temperature and from 55 to 85 per cent of humidity, showed no germination in 6 days; but spores placed on a watch glass under a bell jar in a very moist atmosphere at from 20 to 35° and watered every 2 to 7 hours germinated in from 2 to 4 days, but after 6 or 7 days no further germination occurred. It is inferred from these tests that the power of germination is retained for about 5 days under conditions favorable to germination, but that it is lost very quickly in a less moist atmosphere, supposedly because of desiccation; that it is the occurrence simultaneously of favorable conditions of temperature and moisture that is to be feared; and that it is at such times that treatment should be employed.

Infection experiments with mildew in Hungary, P. Labue (*Rev. Vit., 37 (1912), No. 954, pp. 416–418*).—A résumé of an article already noted (E. S. R., 27, p. 47).

Anatomo-pathological investigations on roncet, A. Biasco (*Ann. R. Scuola Sup. Agr. Portici, 2. ser., 9 (1909), Art. 15, pp. 1–9*).—A brief account is given of the anatomical alterations marking the progress of this disease.

The Panama disease of bananas (*Agr. News [Barbados], 11 (1912), Nos. 260, pp. 126, 127; 261, pp. 142, 143*).—This gives a summary of knowledge relating to some of the diseases of the banana and particularly that known as the Panama disease.

It is thought that there are probably two distinct diseases which affect the vascular bundles, and therefore the water supply, of certain varieties of plantains and bananas. The first is the Moko disease, which is attributed to *Bacillus musæ*, while the second is designated as the Surinam Panama disease, caused by *Leptospora musæ*. In addition it is stated that possibly the Panama disease of Central America is distinct from the above.

Diseases of vanilla, C. MAUBLANC (*Agr. Prat. Pays Chauds, 12 (1912), Nos. 108, pp. 177–188, figs. 2; 109, pp. 277–287, figs. 4*).—The author describes a number of fungus diseases of vanilla, among them anthracnose due to *Calospora vanillæ*, brown spotting of the stems caused by *Nectria vanillæ*, rust caused by *Uredo scabies*, leaf spots caused by *Fusicladium vanillæ*, *Phyllosticta vanillæ*, *Amerosporium vanillæ*, *and Ocellaria vanillæ*, and attacks by *Scuratia coffeicola*, *S. vanillæ*, and *Cephaleuros henningsii*.

Notes upon tree diseases in the eastern States, P. SPAULDING (*Mycologia, 4 (1912), No. 3, pp. 148–151; abs. in Phytopathology, 2 (1912), No. 2, p. 93*).—The author describes a number of diseases of forest trees in the eastern United States. Notes are given on the distribution of the chestnut blight to the North, South, and West.

A serious disease of balsam fir, caused by *Lophodermium nervisequum*, is noted as occurring in the Adirondack region. It causes the death of much young growth. Infection occurs in June, the fruiting bodies being formed on the same needles about a year later.

An apparently serious disease of maple, caused by *Myxosporium acerinum*, is described. The disease is said to be widespread and affects the smaller branches. Cutting out and burning the affected branches seems to be the only practical method of treatment.

A disease of Norway and other spruces, due to *Phoma piccina*, which results in the defoliation and death of trees, is described.

Fungus root rot, W. T. HORNE (*Mo. Bul. Com. Hort. Cal., 1 (1912), No. 6, pp. 216–225, figs. 7*).—This disease, known also as oak fungus, toadstool disease, etc., and ascribed to the activity of *Armillaria mellea* (other fungi possibly also participating), is said to affect a great variety of trees which are woody and long lived and to be much more abundant than is commonly supposed. It works in areas which tend to enlarge from year to year, revealing its presence by large light brown toadstools beside or around the diseased trees, usually during November and December, and arising from decayed roots of some size deep below the surface of the ground. Immense numbers of spores are produced but these do not seem to spread the disease so actively as do the diseased roots. From their subterranean mycelium often arise shiny black cord-like strands which are able to penetrate the soil for several inches or more and attack healthy roots when reached, thus starting new lines of propagation. The mycelium also spreads upward into a somewhat fan-shaped growth, forming a felty white body within the bark of the trees affected. This white mass crowds directly into the perfectly healthy living portion, with the result that this puffs up and becomes watery and often filled with gummy or gelatinous material. The advance of the mycelium is favored by moisture and tends to cause a very complete white rot of the wood.

It is said to be well to dig and dry the toadstools before they pass beyond the button stage and mature their spores, also to dig and burn or dry the diseased roots, which are almost always of the larger size. The land should then be planted to annual crops not attacked by fungus for a sufficient time to allow the old roots with their mycelium to disappear, or else after a time with trees more or less immune, as pears, black walnuts, figs, cherries, etc. Experiments intending to check the spread along diseased roots, as by uprooting a zone of sound trees, placing a wall of tarred paper around the infected area, etc., have been attempted with varying expense and success.

The fungus of the chestnut tree blight, W. G. FARLOW (*Science, n. ser., 35 (1912), No. 906, pp. 717–722*).—A discussion is presented relating to the

identity of the fungus which is held to cause the blight of the chestnut tree. The author states that so far as can be distinguished by the morphological characters, *Diaporthe parasitica* as described by Murrill (E. S. R., 19, p. 251) resembles the Italian *Endothia radicalis* so closely that they can not be separated specifically unless it be by some peculiarity not hitherto recorded.

A twig disease of elms, J. Eriksson (*Mycol. Centbl., 1 (1912), No. 2, pp. 35–42, pl. 1, figs. 3*).—The author describes a disease found on *Ulmus montana, U. montana exoniensis, U. campestris*, and *U. effusa*, which usually attacks the younger shoots and plants, dotting the surface with small black pustules and finally killing the affected parts or plants.

The disease is ascribed to a fungus found in connection therewith. This is claimed to be new and is described under the name *Exosporium ulmi*. Attempts with artificial inoculation were successful in several instances, reproducing the characteristic symptoms of the disease and killing the infected twigs or young plants. As protection against this disease the author recommends careful inspection of nursery stock before purchase and repeated examination of suspected trees with removal and destruction by fire of all dead or visibly infected twigs.

Fungus enemies of Canada poplar in Santena, P. Voglino (*Ann. R. Accad. Agr. Torino, 53 (1910), pp. 325–377, figs. 4*).—Descriptions are given of 33 species of fungi and bacteria known to infest Canada poplar in Italy.

Hevea rubber stumps as possible carriers of disease (*Agr. News [Barbados], 11 (1912), No. 262, p. 158*).—Attention is called to the statement of Stockdale that imported Para rubber stumps showed the presence of fungi, and a warning given against their indiscriminate introduction. Through the careless importation of rubber stumps it is thought probable that a number of fungi might be introduced, among them *Thyridaria tarda, Hymenochæte noxia, Fomes semitostus*, and *Corticium salmonicolor*.

Immortel canker, F. W. South (*Agr. News [Barbados], 11 (1912), No. 263, p. 174*).—In an account of a recent visit to St. Lucia the author describes a disease of immortel (*Erythrina umbrosa*), which has been known to exist for some time in that island. The disease usually starts from a cut surface, spreads rapidly, and generally kills the tree. In its early stages the bark is somewhat split and covered with a thin, shiny, transparent coating, probably consisting of a dried gummy secretion. Inside the bark is rotted, wet, and of a reddish color. Between the wood and the bark were found numerous insects, which were working almost to the advancing margin of the diseased area. As the disease progresses the parenchyma of the bark is destroyed, and the bark dries and falls off the trees in sheets.

A disease of the same species of Erythrina has been reported from Ceylon as due to the same fungus as that causing canker of cacao. This fungus, however, has been determined as *Phytophthora faberi*, a fungus which has not been found to develop from diseased immortel bark in St. Lucia.

It is believed that cutting out and burning the diseased bark, followed by an application of tar, would control the disease.

Pestalozzia hartigi, a new parasite of the silver fir, T. Lagerberg (*Meddel. Stat. Skogsförsöksanst. (Mitt. Forstl. Vers. Anst. Schwedens), 1911, No. 8, pp. 95–107, V, VII, figs. 10*).—An account is given of a new disease found on young firs in seedbeds and nurseries in Sweden. The plants are first covered with dark or black spots; the lower portions become constricted, and the upper swollen; and the twig or plant finally dies. Cultures were grown and examined, and the disease was attributed to a fungus, *P. hartigi*.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

The vertebrates. O. JAEKEL (*Die Wirbeltiere. Berlin, 1911, pp. VIII+252, figs. 281*).—This work deals with both fossil and living forms.

A pocket list of the birds of eastern Massachusetts with especial reference to Essex County, A. P. MORSE (*Salem, Mass., 1912, pp. 92, tables 6, pl. 1*).—This list includes charts which show the months of the year in which the various species are present in eastern Massachusetts.

The senses of insects, A. H. FOREL (*Das Sinnesleben der Insekten. Munich, 1910, pp. XV+393, pls. 2*).—This is a collection of experimental and critical studies of insect psychology.

Control of insects and diseases in grove, garden, and field, N. M. G. PRANGE (*St. Augustine, Fla., 1912, pp. 156*).—This is a brief popular work.

The destruction of insects and other injurious animals, A. L. CLÉMENT (*Destruction des Insectes et Autres Animaux Nuisibles. Paris [1911], pp. 135, figs. 400*).—This work consists of 5 chapters which take up the subject as follows: (1) The life and anatomy of insects; (2) methods of destruction; (3) insects and other injurious articulates; (4) insects grouped according to the plants which they injure; and (5) injurious animals other than articulates.

Potassium cyanid as a larvicide, S. T. GUNASEKARA (*Brit. Med. Jour., 1912, No. 2678, p. 981*).—In tests of the effect of potassium cyanid on anopheline larvæ, the author found 1 part in 75,000 to destroy the larvæ in 12 hours, whereas 1 part in 150,000 had no effect. When used in stagnant pools the results obtained were variable; the highest dilution having any effect was 1 in 50,000 and in some pools as much as 1 in 35,000 was required. A solution of 1 in 37,500, or 8 times the strength recommended, was required for most pools.

Fourth annual report of the state entomologist of Indiana. B. W. DOUGLASS (*Ann. Rpt. State Ent. Ind., 4 (1910–11), pp. 266, figs. 207*).—This report consists of papers on peach growing in Indiana (pp. 13–40); insect enemies and diseases of the peach (pp. 41–66); insects injurious to shade trees, including a list of trees (pp. 67–226); miscellaneous notes on injurious insects (pp. 227–233); and bee keeping (pp. 235–261).

Forty-second annual report of the Entomological Society of Ontario, 1911 (*Ann. Rpt. Ent. Soc. Ontario, 42 (1911), pp. 114, figs. 40*).—Among the more important papers here presented are the following: Reports on Insects of the Year, by A. Gibson (pp. 9–25); Some of the Work of the Division of Entomology in 1911, by C. G. Hewitt (pp. 25–27); Insects of the Season in Ontario, by L. Caesar (pp. 28–36); Notes on the Season of 1911, by T. W. Fyles (pp. 36–38); Some Injurious Forest Insects at De Grassi Point, Lake Simcoe, by E. M. Walker (pp. 55–63); Thrips Affecting Oats, by C. G. Hewitt (pp. 63–65); A Hymenopterous Parasite of *Hepialus thule*, by A. F. Winn (pp. 70, 71); Injurious Insects of the Year, MacDonald College, Quebec, by J. M. Swaine (pp. 72–74); Insect Migration at Aweme, Manitoba, by N. Criddle (pp. 74–76); The Preparation of a Catalogue of the Insects of Canada (pp. 79–81), by C. G. Hewitt; Some Notes on *Hepialus hyperboreus*, by H. Dawson (pp. 81, 82); and Blister Beetles, by A. Gibson (pp. 83–88).

Report of the division of plant protection for the year ended June 30, 1911, C. BRICK (*Jahrb. Hamburg. Wiss. Anst., 28 (1910), pp. 312–337*).—This detailed report of inspection and other work conducted during the year includes a list of the insects, etc., infesting imported plants, the occurrence of insect enemies and diseases of cultivated plants during the year, and an index thereto.

Insect pests of cereals and fruit trees in Russia. I. A. PORCINSKII (*Exhrg. Dept. Zeml. [Russia], 1909, pp. 608, 609; abs. in Internat. Inst. Agr. [Rome],*

Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 6, p. 1532).—An invasion of *Agrotis* sp. occurred in 1909 in many Governments in Russia, but caused serious loss only in the Governments of Tula and Ryazan. *Diplosis tritici* invaded wheat fields and caused considerable injury in the district of Beleev. In eastern Russia serious injury was caused by the invasion of *Hylemyia coarctata*, the larvæ of which destroyed young spring wheat seedlings. *Rynchites pauxillus*, which partially destroyed the foliage of fruit trees, is reported to be spreading in southern Russia.

Insect pests of fruit trees in Russian Central Asia, I. A. Porcinskĭĭ (*Ezheg. Dept. Zeml. [Russia], 1909, pp. 602–604; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 6, p. 1546*).—The codling moth, which was formerly unknown in Central Asia, appears to have been introduced since the opening of the railways with consignments of fruits and plants and has become very destructive in apple orchards throughout Turkestan, where it has no natural enemies to prevent its spread.

Mention is made of the injury by *Tingis pyri* which attacks the pear; *Oxythyrea cinctella*, which attacks the blossoms of fruit trees; and *Coleophora alcyonipenella* and *Agelastica* sp., the latter of which devours the foliage of the walnut and almond.

Notes on injurious insects observed, C. W. Jemmett (*Ann. Rpt. Agr. Dept. [South. Nigeria], 1910, pp. 26–30*).—These notes deal with the enemies of cotton, corn, maize, cacao, etc.

Report on economic entomology, F. P. Jepson (*Dept. Agr. Fiji Council Paper 25, 1911, pp. V+89, pls. 6*).—This report by the government entomologist deals with the Fijian insect pests as follows: Arthropoda injurious to man and animals; insects, etc., injurious to cultivated crops, including coconut, banana, sugar cane, cacao, pineapple, custard apple, granadillas, yaqona (*Piper methysticum*), cotton, yams, tobacco, melons and pumpkins, and oranges; insects injurious to ornamental shrubs; insects injurious to stored goods; and insects injurious to timber.

The 5 appendixes consist of a glossary of technical terms, directions for the collection of insects, reports on a visit to the Lau group and to Honolulu, and notes on sprays and washes used as insecticides.

The enemies of the orange and lemon in Spain, D. L. de Salas y Amat (*Bol. Agr. Téc. y Econ., 4 (1912), Nos. 38, pp. 167–181; 40, pp. 365, 373*).—This account deals with the important insect enemies of citrus in Spain, and the remedial measures therefor.

Mango pests in Cavite and Rizal Provinces, P. J. Wester (*Philippine Agr. Rev. [English Ed.], 4 (1911), Nos. 6, pp. 312–314; 12, p. 681*).—It is stated that in driving through Imus and adjoining barrios the mango blossoms were observed to be almost universally blackened and dead. By sucking the juices from the buds and tender stems, the homopterous insects *Idiocerus clypealis* and *I. niveosparsus* injure them, causing the flowers to drop. They also secrete a honeydew, in which a sooty mold develops, the presence of the insects being readily detected by the blackened leaves and flower panicles. At Imus, insects had practically ruined the season's mango crop, and they were doing great damage to the mangoes at San Francisco.

Another pest that appears to be quite destructive to the mango bloom is a caterpillar that enters the central stem of the flower panicle and hollows it out, causing it to shrivel and die.

Insect enemies of poplars and willows, P. Lesne (*Jour. Agr. Prat., n. ser., 23 (1912), No. 14, pp. 433–439, pl. 1, figs. 7*).—This is a brief account of some of the more important enemies.

The enemies of Populus canadensis, P. Voglino (*Ann. R. Accad. Agr. Torino, 53 (1910), pp. 315–444, figs. 16*).—The first part of this paper (pp. 325–377) deals with the vegetable enemies, the second part (pp. 378–440) with the insect enemies, of which 45 species are considered.

The tarbagans and the plague, L. J. Tchaoushov (*Vrach [St. Petersb.], 1911, No. 24–25; abs. in Off. Internat. Hyg. Pub. [Paris], Bul. Mens., 3 (1911), No. 9, pp. 1626–1630*).—This paper on *Arctomys bobac* deals with its distribution, habits, and diseases, especially in its relation to plague.

Termites and living plants, J. Chaine (*Compt. Rend. Soc. Biol. [Paris], 71 (1911), No. 36, pp. 678–680; 72 (1912), No. 3, pp. 113–115*).—These, the sixth and seventh papers (E. S. R., 24, p. 753) on the subject, deal with the protection of plants from termites.

New genera and species of North American Thysanoptera from the South and West, J. D. Hood (*Proc. Biol. Soc. Wash., 25 (1912), pp. 61–75, pl. 1, figs. 6*).—The forms here described as new are *Stomatothrips flavus* n. g. and n. sp., from Monterey, Mexico; *Bregmatothrips venustus* n. g. and n. sp., *Haplothrips graminis* n. sp., and *Scopœothrips unicolor* n. g. and n. sp., all 3 taken at Brownsville, Tex.; *Rhopalothrips bicolor* n. g. and n. sp., taken on Opuntia, near Monterey, Mexico; and *Liothrips varicornis* n. sp., swept from grass and weeds at Monterey, Mexico.

Instructions for the destruction of locusts (*Instrucciones para la Destrucción de la Langosta. Buenos Aires: Govt., 1910, pp. 60, figs. 25*).—This paper gives detailed information on the destruction of locusts in Argentina.

The hemipterous enemies of cotton in Africa, H. Schouteden (*Rev. Zool. Afric. [Brussels], 1 (1912), No. 3, pp. 297–321, pls. 2, figs. 12*).—The cotton insect pests here considered are the cimicid *Calidea apicalis*, the coreid *Leptoglossus membranaceus*, several species of Dysdercus, 4 species of Oxycarenus, several plant lice of the genus Aphis, and the coccids *Pseudococcus* (*Dactylopius*) *perniciosus* and *Chionaspis aspidistræ gossypii*.

Recent studies on the spontaneous distribution of phylloxera, B. Grassi and M. Topi (*Atti R. Acad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 20 (1911), II, No. 11, pp. 603–611; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 2, p. 574*).—The following conclusions have been drawn by the authors:

"It is wholly unlikely that phylloxera can, in compact earth not fissured or mined, affect its spread through the earth without returning to the surface, and thus infecting the roots of other vines The influence of light on the direction of the path of the new born phylloxera insect is beyond doubt; it is attracted by light as certain moths by the lamp.

"It is likewise beyond doubt, on the other hand, that the new born phylloxera insects can attach themselves and grow without ever having seen the light, taking up their abode on the same root on which they are born (after returning to it, should they happen to have left it). Or they may pass to the other roots of the same or different vines, either in contact with or quite close to the first, traversing the fissures in the soil, the galleries burrowed by animals, the cavities formed by the working of the soil, by decomposition, by putrefaction of organic substances, etc.

"It is not in the like degree certain, but is nevertheless probable, that the new born phylloxera insect reaches the surface whenever attracted there by a little light through the soil; thus the insect obeys the influence of positive phototropism to which it is certainly subject, independently of the quality and quantity of the food it finds available. Probably, once it has reached the surface, the insect does not descend again until after night has set in."

The woolly aphis and the apple in Argentina, J. M. Huergo (*Bol. Min. Agr.* [*Buenos Aires*], *13* (*1911*), *No. 7, pp. 358–401, pl. 1, figs. 22*).—A brief account is given of the injury caused by the woolly aphis in Argentina, with directions for combating it.

White fly control, E. W. Berger (*Fla. Quart. Bul. Agr. Dept., 22* (*1912*), *No. 2, pp. 38–113*).—This is a summarized account of recent work.

Notes on Cuban white flies with description of two new species, E. A. Back (*Canad. Ent., 44* (*1912*), *No. 5, pp. 145–153, figs. 7*).—Nine species are recorded from Cuba, of which *Aleurodicus cardini*, taken from the guava (*Psidium guajava radii*) at Havana and Santiago de las Vegas, and *Aleyrodes trachoides*, taken from an indigenous solanaceous vine (*Solanum seaphorthianum*) at Santiago de las Vegas, are described as new to science. *A. cardini* is said to become quite abundant on guava at times and when not parasitized becomes the source of injury. In May, 1911, the author received specimens from Cuba, over 90 per cent of which had been parasitized by a hymenopteron.

The other species recorded from Cuba are *Aleyrodes citri*, *A. nubifera*, *A. howardi*, *A. variabilis*, *A. floridensis*, *A. mori*, and *Paraleyrodes perseæ*.

A new coconut pest, D. B. Mackie (*Philippine Agr. Rev.* [*English Ed.*], *5* (*1912*), *No. 3, pp. 142, 143, pl. 1*).—The coconut white fly (*Aleurodicus destructor*), first collected in the vicinity of Guijulngan in May, 1911, is said to be confined to a district in Negros Oriental, extending from the barrio of Tabon on the north and the barrio of Zamora on the south, a range of some 35 km. (about 21.7 miles) in length. Most of the coconut groves in this area, which extends from the seacoast back to a range of hills to the west, are infested.

The San José scale, F. Lahille (*Bol. Min. Agr.* [*Buenos Aires*], *13* (*1911*), *No. 7, pp. 410–416, pls. 2, figs. 2*).—A brief general account.

The plum scale (Lecanium cerasifex), J. C. Chapais (*Nat. Canad., 38* (*1912*), *No. 10, pp. 145–151*).—This paper consists of biological notes and directions for combating *L. cerasifex*, which appeared in orchards at Kamouraska, Province of Quebec, in 1911.

Native and foreign parasites of Diaspis pentagona, so far known and introduced into Italy, G. Martelli (*Abs. in Internat. Inst. Agr.* [*Rome*], *Bul. Bur. Agr. Intel. and Plant Diseases, 2* (*1911*), *No. 6, pp. 1521, 1522*).—This is a summary of the work with parasites of the mulberry or West Indian peach scale.

Three common coccid enemies of the orange, A. H. Rosenfeld (*Rev. Indus. y Agr. Tucumán, 2* (*1911*), *No. 3, pp. 116–133, pl. 1*).—Descriptions of the purple scale, Florida red scale, and fern scale, with methods for their control.

Gipsy and brown-tail moth suppression, F. W. Rane (*Ann. Rpt. State Forester Mass., 8* (*1911*), *pp. 81–144, pls. 4*).—Details of the work of the year with these 2 pests are presented.

A newly invented power truck sprayer from which the tank can be easily removed, and the truck then used the same as any truck, is described. With this sprayer it is possible to spray both sides of the highway at the same time, while traveling.

A brief report of the work of the year with insect parasites by Dr. L. O. Howard is included. The recovery in large numbers of the Japanese egg parasite of the gipsy moth, *Schedius kuvanæ*, was a very encouraging feature of the summer's work. Field observations showed that it had practically become established and that in some localities 30 per cent of the eggs in a given mass had been destroyed by it. The parasite "*Monodontomerus æreus*, which attacks the gipsy and brown-tail moths in the pupal stage, is now to be found practically over the whole of eastern Massachusetts, in several towns near

Providence, R. I., through the southern part of New Hampshire, and into eastern Maine to a point nearly to Bangor. Another species, the *Pteromalus egregius*, referred to in previous reports, and which destroys the brown-tail caterpillars in the winter web, has been found in small numbers over a widely scattered area in Massachusetts, New Hampshire, and Maine. Two other species have greatly increased their range; these are *Apanteles lacteicolor* and *Meteorus versicolor*."

Some very good results are thought to have been obtained in several places from work with the gipsy moth wilt disease, the work with which will be prosecuted on a much larger scale during the following year. More plantings of the brown-tail fungus were made with apparently excellent results. The fungus disease of the gipsy moth is said to still be in the experimental stage. The conditions of the moth work at the present time in cities and towns in the infested district are described.

[Silkworm studies] (*Lab. Études Soie Lyon, Rap. Com. Admin., 14 (1908–1910), pp. XVI+261, pls. 25, figs. 36*).—The sericultural papers here presented include the following: A Study of the Utilization of Cold in Sericulture, by J. Testenoire (pp. 47–54); On a Muscardine of the Silkworm not Caused by *Botrytis bassiana;* A Study of *B. effusa* n. sp., by J. Beauverie (pp. 55–81), previously noted (E. S. R., 26, p. 757); Description of the Habits of *Cricula andrei*, by E. André (pp. 83–89); New and Little Known Saturnids and Pinarids of Senegal, by P. Riel (pp. 91–99); A Study of the Wild Silkworm *Borocera madagascariensis*, by Grangeon (pp. 101–118); The Accustoming of the Silkworm (*Bombyx mori*) to the Leaves of *Scorzonera hispanica*, by C. Villard (pp. 119–122); A Psychid Case Bearing Silkworm (*Eumeta junodi*), (pp. 123–125); and Researches on the Development of the Egg of the Univoltin Silk Moth (pp. 127–152) (E. S. R., 23, p. 759), both by C. Vaney and A. Conte; The External Sexual Characters of Chrysalids (pp. 153, 154), and The Diseases of Silkworms, in which pebrine is dealt with, by D. Levrat and A. Conte (pp. 155–163); A Bostrichid (*Xylothrips flavipes*) Injurious to Silk (pp. 163–167), by A. Conte and D. Levrat; The Genus Theophila and the Affinities of *Bombyx mori* (pp. 169–174), and A Classification of the Lepidopterous Silk Producers (pp. 175–256), both by A. Conte.

Potato moths in Bengal in 1911, E. J. Woodhouse (*Dept. Agr. Bengal, Quart. Jour., 5 (1912), No. 3, pp. 146–153*).—This is a second report (E. S. R., 25, p. 761).

Notes on the life history of Nepticula slingerlandella (Tineidæ), C. R. Crosby (*Canad. Ent., 44 (1912), No. 1, pp. 25–27*).—The data here presented have been noted from another source (E. S. R., 26, p. 557).

Mosquitoes and river vessels, A. Balfour (*Lancet [London], 1912, I, No. 16, pp. 1048–1051, fig. 1*).—The author states that the constant attention which has been given has not prevented the invasion of Khartum every now and then by mosquitoes (*Stegomyia fasciata, Culex fatigans*, etc.) from steamers and boats plying on the Nile. "Not a year passes but that cases of locally acquired malaria are traced, more or less definitely, to infected anophelines brought into the town precincts by river vessels."

Some parasites of Simulium larvæ and their effects on the development of the host, E. H. Strickland (*Biol. Bul. 21 (1911), No. 5, pp. 302–338, pls. 5*).—Two parasites, one a worm (*Mermis* sp.) and the other a new sporozoon for which the name *Glugea polymorpha* is proposed, have been found by the author commonly to infest Simulium larvæ (*S. hirtipes* and an undescribed species) in streams in the vicinity of Forest Hills, Mass. The Mermis does not affect the larval development to any extent, except by slightly increasing its size, but it inhibits the development of the histoblasts to such an extent that

pupation becomes impossible. Parasitized larvæ never pupate, but are killed by the worms when they escape. Of 174 larvæ examined, 41 were found to be parasitized. In one case as many as 12 worms were removed from a single host; they all remained small apparently from insufficient food supply.

Parasitism by *G. polymorpha* was found to vary from 1 to 80 per cent.

On the life history of the ox warble (Hypoderma bovis), PETER (*Mitt. Deut. Landw. Gesell., 27 (1912), No. 11, pp. 156–163, figs. 6*).—In this paper the author reports the results of studies commenced in March, 1910, and continued during the summer of 1911 at Hamburg abattoirs. Illustrations showing the development of the larvæ during the various months of the year are included.

How to get rid of flies, F. P. STOCKBRIDGE (*World's Work, 23 (1912), No. 6, pp. 692–703, figs. 11*).—This paper includes accounts of fly campaigns conducted during 1911 in Weir and Topeka, Kans., Wilmington, N. C., Boston and Worcester, Mass., Baltimore, Md., Washington, D. C., and other cities and towns.

[Transmission of Trypanosoma hippicum by the house fly] (*Rpt. Dept. Sanit. Isthmian Canal Com., 1912, Apr., p. 41*).—"*Musca domestica* caught in Panama were fed with the blood of guinea pigs richly infected with trypanosomes (*T. hippicum*), and after intervals of 23, 46, and 126 minutes microscopic examinations of fluid from the proboscis of some of the flies were made, and animal inoculations were made with material from others. Actively motile living trypanosomes were demonstrated in the mouth parts of the flies 126 minutes after feeding. . . .

"The fact here experimentally established that *M. domestica* can carry living trypanosomes for so long a time as 2 hours shows that with the naturally acquired disease ample time is given for the transference of the infecting agent from the excoriated patches on the skin of infected mules to the freshly abraded surfaces on the skin of noninfected mules, as was previously assumed from an epidemiological study of the disease and its probable mode of infection."

African fruit flies, F. ZACHER (*Tropenpflanzer, 16 (1912), No. 5, pp. 236–243, figs. 3*).—Eleven species of Ceratitis and Dacus are known to be of economic importance in Africa.

Fruit fly control, W. M. GIFFARD (*Hawaii. Forester and Agr., 9 (1912), No. 4, pp. 108–114*).—A brief report of work carried on against the Mediterranean fruit fly in Hawaii.

Systematic notes on North American Tachinidæ, J. D. TOTHILL (*Canad. Ent., 44 (1912), No. 1, pp. 1–5*).—*Winthemia fumiferanæ* bred from the spruce budworm (*Tortrix fumiferanæ*) in the Provinces of Quebec and British Columbia is described as new to science.

Narcissus fly (Merodon equestris) [attacking Galtonia candicans], E. H. JENKINS (*Gard. Chron., 3. ser., 50 (1911), No. 1296, p. 310*).—The author has repeatedly found the larva of *M. equestris* in Dutch cultivated bulbs of *G. candicans*, the earliest instance having been some 22 years ago. In the case of the daffodil, discoloration of the outer tissues of the bulb is a not infrequent indication of the presence of the larva, though it may be as frequently due to the presence of the bulb mite (*Rhizoglyphus* sp.).

Mustard beetles, R. S. MACDOUGALL (*Jour. Bd. Agr. [London], 18 (1911), No. 12, pp. 1017–1020, fig. 1*).—The insects here considered are the mustard beetle (*Phædon betulæ*) and the turnip, mustard, and cabbage flower beetle (*Meligethes æneus*).

An experimental study on the death feigning of Belostoma (=Zaitha Aucct.) flumineum and Nepa apiculata, H. H. P. and H. C. SEVERIN (*Behavior Monographs, 1 (1911), No. 3, pp. 44, pl. 1; abs. in Science, n. ser., 35 (1912), No. 903, pp. 628–630*).—The general characteristics of the death feint are dis-

cussed, together with the duration of successive death feints; the effect of dryness and moisture, temperature, and light on the duration; the effect of mutilation; the origin and development of the death feint; and its psychic aspect. A bibliography of 28 titles is appended.

Dascillus cervinus as a marshy meadow pest, W. HEROLD (*Centbl. Bakt. [etc.], 2. Abt., 33 (1912), No. 17–19, pp. 438–442, pl. 1, figs. 6*).—The larva of this beetle is reported to have been the source of injury to meadows in the southern part of the Province of Posen.

A new enemy of the coconut palm, G. HERSCHER and L. MILLOT (*Abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 6, pp. 1552–1554*).—A small nocturnal beetle of the genus Hylecoetus, the larva of which bores in the trunk, is reported to be a serious enemy of the coconut palm all along the northwestern coast of Madagascar.

A grove of deformed trees, R. J. TERRY (*Science, n. ser., 35 (1912), No. 905, p. 715*).—A grove of 400 or 500 small persimmon trees in St. Louis County, Mo., is said to have suffered from the ravages of beetles (*Oncideres cingulata*), limbs of young and old trees varying in diameter from 5 to 15 mm. (from 0.2 to 0.6 in.) being girdled and the ends falling to the ground. The girdling is said to be done mainly in September and October.

"There is no tree in the grove that does not present crooked trunk and limbs. The deformities in some cases are extreme. Most of the trees are as a consequence dwarfed, although able to make some advance in growth."

On an enemy of the coffee tree, L. DUPORT (*Bul. Écon. Indo-Chine, n. ser., 14 (1911), No. 90, pp. 392–397, fig. 1*).—An account of *Xyleborus coffeæ* and its injury to *Coffea robusta* in Indo-China.

Bark beetles (Ipidæ) which live in rubber trees, M. HAGEDORN (*Rev. Zool. Afric. [Brussels], 1 (1912), No. 3, pp. 336–346, pl. 1, figs. 11*).—Twelve species are here dealt with, namely, *Diamerus fici*, *Phlœotribus puncticollis*, *Stephanoderes congonus* n. sp., *S. heveæ* n. sp., *Hypothenemus tuberculosus* n. sp., *Cryptarthrum walkeri*, *Xyleborus affinis*, *X. ambasius* n. sp., *X. camerunus*, *X. cognatus*, *X. confusus*, and *X. spathipennis chausi* n. var.

A new enemy of the Douglas fir (Pseudotsuga douglasii), M. DE KONING (*Abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 6, p. 1554*).—The beetle *Strophosomus obesus* is said to have destroyed the annual shoots of Douglas fir in the Province of North Brabant, Netherlands, young trees being most severely injured. Gradually the dead branches lose their needles and nothing remains but dry wood. Careful observation shows that the bark at their base has been eaten away. As the injured branches live on for some time, the sap which oozes out sometimes forms a thickening just above the wound.

Apiculture in Tunis (*Bul. Dir. Gén. Agr. Com. et Colon. Tunis, 14 (1910), No. 57, pp. 448–475, pls. 2, fig. 1; 15 (1911), Nos. 58, pp. 74–107, pl. 1, fig. 1; 61, pp. 645–700, figs. 6*).—A general account of bee keeping in Tunis with statistical data.

Bee diseases in Ontario, M. PETTIT (*Ontario Dept. of Agr. Bul. 197, 1912, pp. 16, figs. 4*).—This is an account of American foul brood, European foul brood, and starved or pickled brood, their prevention and treatment. A report of inspection of apiaries of Ontario follows.

Report on the Isle of Wight bee disease (microsporidiosis) (*Jour. Bd. Agr. [London], 19 (1912), No. 2, Sup. 8, pp. 143, pls. 6, figs. 2*).—This report consists of 13 parts, in addition to an extensive bibliography, which take up the subject as follows: Introduction, by G. S. Graham-Smith (pp. 5–11); The History of the Disease (pp. 12–28) and Symptoms (pp. 29–38), by G. W. Bullamore and W. Malden; The Relation of *Nosema apis* to the Isle of Wight Disease, by G. S.

Graham-Smith, H. B. Fantham, and Annie Porter (pp. 39–56); The Life History of *N. apis*, and the Significance of the Various Stages of the Parasite in the Disease, by H. B. Fantham and Annie Porter (pp. 57–78); Experimental Infection with *N. apis:* (a) Earlier Infection Experiments, by H. B. Fantham and Annie Porter (pp. 79–81), and (b) Infection Experiments Carried out During 1911, by G. S. Graham-Smith and G. W. Bullamore (pp. 81–94); The Ways in Which the Disease may be Spread, by G. S. Graham-Smith and G. W. Bullamore (pp. 95–118); Some Field Observations on Natural Methods of Infection, by H. B. Fantham and Annie Porter (pp. 119–122); Examinations of Certain Insects Found in Hives, by H. B. Fantham and Annie Porter (pp. 123, 124); Treatment and Prevention, by G. S. Graham-Smith and G. W. Bullamore (pp. 125–129); Microsporidiosis in Other Hymenoptera: (a) Infection Experiments, by H. B. Fantham and Annie Porter (pp. 130, 131), (b) Observations on Humble Bees, by H. B. Fantham (p. 131), and (c) Infection Experiments and Observations, by G. S. Graham-Smith (pp. 131, 132); Bacteriology of the Disease, by W. Malden (pp. 133–137); and Note on Certain Protozoa Found in Bees, by H. B. Fantham and Annie Porter (p. 138).

A contribution to the embryology and to the biology of Apanteles glomeratus, R. Grandori (*Redia, 7 (1911), No. 2, pp. 363–428, pls. 4, fig. 1*).—A detailed report of studies of this braconid parasite of the cabbage butterfly (*Pieris brassicæ*).

The pear slug (Caliroa cerasi [Eriocampoides limacina]), R. L. Webster (*Iowa Sta. Bul. 130, pp. 167–192, figs. 13*).—This is a detailed report of studies of the life history and bionomics and of remedial measures for the pear slug (*C. cerasi*), a brief account of which has been previously noted (E. S. R., 26, p. 863). The subject is taken up under the headings of control measures; past history, destructiveness, and distribution; food plants; classification; life history; and natural enemies. A bibliography of 35 titles is appended.

The slugs feed on the upper surface of the leaves, removing only the upper portion and leaving the veins bare, badly injured trees appearing as if they had been scorched by fire. The damaged leaves dry, turn brown, curl up, and finally fall. Frequently trees are entirely stripped of their foliage in midsummer. Cherry trees, under such conditions, are forced to put out a new growth of leaves, weakening the tree and greatly reducing the crop of fruit the following year.

There appear to be 2 generations of the insect in central and northern Iowa. In central Iowa the first brood slugs appear in June and early in July and the second late in July and during August, the 2 generations generally being quite distinct. The winter is passed by the slugs within their cocoons in the soil. In the spring they pupate, and late in May and early in June the adult sawflies emerge from the cocoons and deposit their eggs under natural conditions just beneath the epidermis of the upper side of the leaves of cherry, plum, and other trees. The egg hatches in from 10 to 18 days and in the vicinity of Ames most of the slugs have become fully grown and have gone into the soil beneath the trees where they are feeding by July 4, the adult flies emerging about the middle of the month. At Ames most of the second brood slugs have disappeared by the middle of September, although a few straggling ones may be found after that time.

Parthenogenesis is thought to occur in this species although it has not been satisfactorily proven. Large numbers of sawflies have been collected and examined by the author without the discovery of a single male. The author has found much variation in the number of molts passed. Thus in 14 cases closely observed 5 larvæ molted 5 times, 5 molted 6 times, 3 molted 7 times, and 1 molted 8 times.

Investigations show hellebore, lead arsenate, and Paris green to be the least expensive of the treatments recommended. One lb. of hellebore to 5 lbs. of air-slaked lime, or 1 lb. of hellebore to a barrel of water; lead arsenate 2 lbs. to 50 gal. of water; Paris green 1 lb. to 150 gal. of water; kerosene emulsion containing 10 per cent kerosene; whale oil soap, 1 lb. to 2 gal. of water; white laundry soap and Ivory soap, one 10-oz. bar to 2 gal. of water were all effective in combating the pest. Attention is called to the fact that cultivation under infested trees is of value since it disturbs the cocoons in the soil.

A sawfly injurious to the gooseberry, G. Lüstner (*Möller's Deut. Gärt. Ztg., 26 (1911), No. 25, p. 295, figs. 2*).—The sawfly *Nematus ventricosus* is reported to have been a serious enemy of the gooseberry in Germany during the early part of the season of 1911.

The large larch sawfly (Nematus erichsoni), E. B. Dunlop (*Zoologist, 4. ser., 16 (1912), No. 184, pp. 147–156*).—A brief account of this sawfly, its habits, injury, etc., in Great Britain.

A contribution to the knowledge of the galls of North America, A. Trotter (*Marcellia, 10 (1911), Nos. 1, pp. 28–32, pls. 2, figs. 4; 2, pp. 33–61, figs. 17*).—Eighty-eight galls collected by F. Silvestri in Oregon, Washington, California, Arizona, Mexico, and Hawaii are here described, many of which are new.

Information concerning ticks (*Agr. News [Barbados], 10 (1911), No. 246, p. 314*).—A brief account of the occurrence of ticks in the West Indies.

Some new North American Ixodidæ with notes on other species, F. C. Bishopp (*Proc. Biol. Soc. Wash., 24 (1911), pp. 197–208, pl. 1*).—Two new species and 2 new varieties are here described, namely, *Ixodes banksi*, taken from muskrat (*Fiber zibethicus*) in Arkansas; *I. kingi*, taken from the badger (*Taxidea taxus*) and other hosts in Wyoming and other western States; *I. cookei rugosus*, taken from the dog in Oregon, Washington, and California; and *I. angustus woodi*, taken from Baird's wood rat (*Neotoma micropus*), in Texas.

New laboulbeniaceous parasites of acarids, G. Paoli (*Redia, 7 (1911), No. 2, pp. 283–295, pl. 1*).—Three species of Rickia and 3 of Dimeromyces are here described as new.

Handbook of pathogenic protozoa, edited by S. von Prowazek (*Handbuch der Pathogenen Protozoen. Leipsic, 1912, pt. 3, pp. 249–360, pl. 1, figs. 50*).—In this third part (E. S. R., 26, p. 865), the pathogenic trypanosomes are dealt with by M. Mayer (pp. 249–323); the Cnidosporidia (Myxosporidia and Microsporidia), by O. Schröder (pp. 324–344); and the Sarcosporidia, by E. Teichmann (pp. 345–360).

A bibliography accompanies each paper.

FOODS—HUMAN NUTRITION.

[Refrigeration and food products] (*Ber. II. Internat. Kältekong. Wien, 1 (1910), pp. 308, pls. 3; 2 (1910), pp. 1085, pls. 2, figs. 67, dgms. 109*).—A number of papers were presented at the Second International Refrigeration Congress at Vienna of special interest to students of nutrition and related matters. Volume 2 contains the full papers and volume 1 the discussions, lists of members, and other general data.

Among others the following papers may be mentioned: Changes in the Physical and Morphological Character of Foods (Meat, Fish, and Milk), by Bützler; Cooling Houses and Other Buildings in the Tropics, by J. F. H. Koopman; Studies of the Preservation of Horseflesh by Cold and Its Use for Food Purposes, by A. Costa and N. Mori; The Effect of Low Temperatures on

the Life Processes of Fruits and on the Rate of Fermentation of Cider, by H. C. Gore; The Refrigeration of Poultry and Eggs in the United States, by Mary E. Pennington; The Manufacture of Ice, by Sandras; An Improved Method of Packing Gutted Fish for Transport and Keeping it Fresh and Sweet for a Long Time, by A. Soelling; A New Application of Low Temperature to the Preparation of Concentrated Food Extracts or Solids, Particularly Milk Powder, by F. G. Lecomte and A. R. Loinville; The Preservation of Eggs by Low Temperature, by F. Lescardé; Importation and Exportation of Meat to Different Countries with Special Reference to the Use of Cold Storage and Frozen Meat in the Netherlands, by F. B. Löhnis; The Relative Value of Frozen and Refrigerated Meat for Food Purposes, Particularly with Reference to the Army, the Navy, and Public and Private Institutions, by H. Martel; Refrigeration and Ventilation of Inhabited Places, by H. Torrance, Jr.; Relative Value of Frozen and Refrigerated Meat in General and Particularly for the Army and Large Groups, by H. Viry; Cold Storage and the Preservation of Fresh and Salted Meat, by L. van Wanjenbergh; Feeding the Nations, by A. de Wendrich; and Several Methods of Testing Cold Storage Insulation, with Comparative Results, by W. M. Whitten.

The essential constituents in food, E. F. Armstrong (*Chem. World, 1 (1912), No. 5, pp. 147–149*).—A summary of some of the newer work in nutrition, particularly studies of the effects of cooked and uncooked food and similar topics.

Brooklyn Eagle government cook book (*Brooklyn, 1912, 2. ed., pp. 112*).—This publication is a reprint of Farmers' Bulletins 85, Fish as Food (E. S. R., 10, p. 678); 128, Eggs and Their Uses as Food (E. S. R., 13, p. 166); 142, Principles of Nutrition and Nutritive Value of Food (E. S. R., 13, p. 974); 203, Canned Fruit, Preserves, and Jellies—Household Methods of Preparation (E. S. R., 16, p. 392); 293, Use of Fruit as Food (E. S. R., 19, p. 60); and 391, Economical Use of Meat in the Home (E. S. R., 23, p. 165).

Phosphorus in Indian foodstuffs, D. Hooper (*Jour. Asiatic Soc. Bengal, n. ser., 7 (1911), pp. 313–322; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 2, p. 88; Nature [London], 88 (1912), No. 2209, p. 594*).—The data reported have to do with the phosphorus content of polished and unpolished rice, rice polish, Indian wheat, and wheat flour; and of barley, pearl barley, lentils, cheese, cooked fish, cooked potatoes, beans, pineapple, edible birds nest, and other foodstuffs.

The author discusses the alleged relation of phosphorus in milled rice to beriberi. Experiments made with fowls fed rice of varying quality showed that polyneuritis developed when milled rice was used but not with husked rice. With rice containing only 0.277 per cent phosphoric anhydrid the disease appeared in a few weeks, while with rice containing 0.469 per cent it did not appear. Analyses of rice from various parts of India showed that on an average unmilled rice contained 0.65 per cent phosphoric anhydrid and milled rice 0.38 per cent. Pulses (legumes) contained larger proportions, and, according to the author, it is significant that pulse eaters generally remain free from the disease, while their neighbors, who are rice eaters, are attacked by it.

Cryoscopy of meat extract, T. Jona (*Kryoskopie der Fleischextrakte. Pavia, 1911, pp. 15; abs. in Chem. Zentbl., 1912, I, No. 14, p. 1136*).—Results of cryoscopic studies of meat extracts are reported.

Microbial content of cooked sausage, G. Guérin (*Hyg. Viande et Lait, 6 (1912), No. 4, pp. 197–207*).—Results reported show the occurrence of microorganisms in sausage and on sausage casings.

Analyses of wheats and flours [and barleys], J. C. Brünnich (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1910–11, pp. 58–60*).—A large number of

analyses are reported. The data for wheat include the yield, weight per bushel, yield of milling products, composition of the flour, results of baking tests, and similar information.

Technical flour analysis and comparative baking test, O. J. FREED (*Oper. Miller, 17 (1912), No. 7, pp. 467-469*).—The analytical data reported illustrate the methods followed in the technical examination of flour for bread-making purposes.

The effect of organic acids on wheat bread with reference to infection with micro-organisms causing slimy bread, M. P. NEUMANN, K. MOHS, and O. KNISCHEWSKY (*Ztschr. Gesam. Getreidew., 4 (1912), No. 5, pp. 127-132, figs. 3*).—The hay bacillus does not develop and cause slimy bread in an acid dough, provided the acidity is equal to at least 0.3 per cent lactic acid or 0.1 acetic acid.

Sour milk can be used in the baking industry as a convenient method for hindering slimy bread. Organic acids exercise a favorable effect upon the character of the bread, since they increase volume and improve the porous texture. Lactic acid proved the most satisfactory, about 0.5 per cent being the maximum amount desirable. With over 1 per cent the expansion of the dough was not nearly so good. With acetic acid the quantities are somewhat smaller, 0.3 per cent being the maximum amount which can be used without affecting the dough unfavorably. Formic acid, owing to the small quantities in the dough, is without special effect upon the fermentation. According to the investigations reported, 0.2 per cent prevents the development of the micro-organisms causing slimy bread.

Some experiments on the relative digestibility of white and whole meal breads, L. F. NEWMAN, G. W. ROBINSON, E. T. HALNAN, and H. A. D. NEVILLE (*Jour. Hyg. [Cambridge], 12 (1912), No. 2, pp. 119-143*).—The chief purpose of the experiments reported was to study the relative digestibility of white and so-called "standard" breads. The tests were made with 4 men and were of 7 days' duration.

"With regard to digestibility, the information given by the experiments may be looked upon as conclusive. The 4 individuals who ate the breads varied greatly in physical type, and the 2 forms of bread were eaten by all under strictly comparable conditions.

"As measured by energy and protein the degree of absorption in different individuals showed marked uniformity. In the case of phosphorus 1 individual showed a degree of absorption which was considerably less than that of the other subjects. The results as a whole lend no support to any extreme view as to the advantages or disadvantages possessed by standard bread; at any rate as regards the availability of the main, and more familiar food constituents.

"With respect to the availability of their total energy white bread and standard bread differ but little. With regard to protein there is a distinct advantage on the side of white bread, some 3½ per cent more of its nitrogen-content being absorbed.

"On the other hand, the experiments lend no support to the belief that the phosphorus compounds of bread of the "standard" type are worse absorbed than those of white bread, so that the former contains an appreciably larger amount, not only of total, but of available phosphorus. The ratio of available phosphorus to available nitrogen stands, in the case of the standard bread, nearer to the ratio present in efficient mixed dietaries, a circumstance, however, which only becomes of practical significance when bread forms a large proportion of a person's dietary."

Experiments for a shorter period (3 days) were made with 2 of the subjects with 2 breads containing a larger proportion of the wheat berry than so-called

"standard" breads, the results showing that the availability of the nitrogen and phosphorus present was lower. "With regard to the possible importance and special nutritive influence of unknown constituents present in the cortex of wheat, the experiments described yield no evidence. The periods were of course much too short, and, moreover, to judge from the available knowledge on the matter, the milk taken would supply an equivalent for such factors. They can only be of practical importance in cases where bread forms a very large proportion of the total dietary, and their influence can only be tested by long observations carried out on special communities."

Principles of jelly making, NELLIE E. GOLDTHWAITE (*Cornell Reading Courses, Food Ser., 1912, No. 3, pp. 241–254*).—Results of the author's experiments (E. S. R., 24, p. 363) are summarized with particular reference to home jelly making.

Studies of the utilization of dum palm: The chemical composition and food value of its fruit (*Agr. Colon. [Italy], 6 (1912), No. 4, pp. 129–152*).—Analyses are reported and discussed.

[Mince-meat and other pure food and drug topics], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul., 2 (1912), No. 5, pp. 81–92, 94–96*).—Results are reported and discussed, of the examination of 51 samples of mince-meat and of miscellaneous foodstuffs.

Of the samples of mince-meat examined, 19 contained no meat or less than 1 per cent (i. e., no meat fiber could be detected), 18 contained less than 3 to 6 per cent meat, and 14 less than 6 to 10 per cent. In cases of samples containing no meat fiber, "the flavor of meat was undoubtedly due to the presence of meat extract."

Seven of the samples contained glucose. Commenting on the results of their investigations, the authors state that "to add starch or glucose, making the same largely a constituent of the [mince] meat, is equally deceptive. The fruit can not legitimately be tomatoes, or apple skins, or waste material generally discarded as articles of food."

According to the authors' view, few of the preparations examined were entitled to be classed as mince-meats under ordinary definitions.

Vinegar and vinegar laws, J. O. JORDAN (*Mo. Bul. Health Dept. Boston, 1 (1912), No. 3, pp. 57–59*).—A proposed law regulating the sale of vinegar is outlined.

Official food analysis, 1912, R. E. ROSE and A. M. HENRY (*Fla. Quart. Bul. Agr. Dept., 22 (1912), No. 2, pp. 194–197*).—Analyses of miscellaneous food materials are reported.

[Food inspection and other pure food topics] (*Tenn. Food and Drugs Insp. Bul. 5, 1911, pp. 100, fig. 1*).—Results of the examination of a number of miscellaneous foods are reported, and short weights, pure food and drugs, and related topics are discussed.

Camp cookery in the West, C. F. SAUNDERS (*Country Life Amer., 22 (1912), No. 3, pp. 51, 52, figs. 6*).—Camp provisions, methods of camp cookery, and other similar problems are discussed and some recipes given.

Cooking with electricity, ELLEN A. HUNTINGTON (*Deseret Farmer, 7 (1912), No. 37, pp. 792, 793*).—Electrical cooking apparatus is discussed, particularly with reference to its cost.

[Report of the] committee on markets, AMY A. BRADLEY (*Women's Municipal League Boston Bul., 3 (1912), No. 5, pp. 24–26*).—An account is given of the survey work with reference to market conditions in Boston and the attempts which have been made to remedy them.

The budget of a vine dresser's family in Caltagirone, C. CONIGLIO (*Rivista [Conegliano], 5. ser., 18 (1912), Nos. 8, pp. 177–181; 9, pp. 201–206; 10, pp.*

232-235).—Data regarding the amount and cost of individual foods, as well as total expenditures for food, are summarized in this statistical study of the household expenditures of an Italian vineyard laborer's family.

Synthesis of cell building material in plants and animals, E. ABDERHALDEN (*Synthese der Zellbausteine in Pflanze und Tier. Berlin, 1912. pp. X + 128*).—The author discusses fundamental problems of nutrition on the basis of his own extended investigations and the work of others.

Such questions are considered as the work of plant cells, the synthesis of cell building material by plants; the work of animal cells; the transformation of nutritive material in the body substances, blood, and cell substances; the metabolism of carbohydrates, fats, phosphatids, nucleo-proteids, proteids, and inorganic material in organic combination; the solution of the problem of nutrition with synthetic products (E. S. R., 26, p. 869); and the possible application of recent work along such lines to invalid dietetics.

Experiments on the influence of a number of foods upon the solubility of uric acid, M. HINDHEDE (*Skand. Arch. Physiol., 27 (1912), No. 1–3, pp. 87–99, figs. 3*).—Continuing experiments most recently reported (E. S. R., 26, p. 765), the author studied the effects of With oveoods upon the solubility of uric acid and the presence in the urine With aceticid which precipitates. In general, he concludes that a bread, potato, xin, fruit diet, with small amounts of milk, is the ideal in this respect, as distinguished from the sort of vegetarian diet made up chiefly of such foods as beans, peas, lentils, cabbage, salad plants, and spinach.

The influence of an excess of sodium chlorid upon nutrition and renal excretion, A. DESGREZ and MLLE. B. GUENDE (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 15, pp. 939–941*).—According to the results of experiments with dogs which are briefly reported, an excess of sodium chlorid without an excess of water lowered the metabolism of nitrogen qualitatively and quantitatively. When the excess of salt was accompanied by an excess of water the excretion of nitrogen was increased quantitatively but lowered qualitatively. In all cases an excess of sodium chlorid apparently diminished cleavage processes qualitatively. It would seem that salt in excess, lowering, as it does, elaboration and elimination, would favor autointoxication.

The elimination of caffein: An experimental study of Herbivora and Carnivora, W. SALANT and J. B. RIEGER (*U. S. Dept. Agr., Bur. Chem. Bul. 157, pp. 23*).—According to the authors' investigations, continuing previous work (E. S. R., 27, p. 166) caffein introduced subcutaneously, by mouth, or intravenously, is eliminated by rabbits and guinea pigs in part unchanged, in the urine, into the gastrointestinal canal, and into the bile. The amount recovered in the urine was in most cases approximately from 6 to 10 per cent with rabbits and from 6 to 11 per cent with guinea pigs. More caffein was eliminated in the urine on a diet of carrots than of oats and hay, but the reverse was noted with the elimination into the gastrointestinal tract, which was marked with both kinds of animals.

"The presence of very small quantities of caffein in the gastrointestinal contents of animals at the end of 48 hours points to its reabsorption into the circulation, since destruction of caffein is highly improbable on account of its resistance to bacterial action."

Cats and dogs were found to eliminate very small quantities, slightly over 1 per cent of the amount ingested. "The elimination of caffein begin soon after its introduction into the circulation. It was found in the urine from 15 to 40 minutes after its subcutaneous injection and in some cases continued to be present for 48 hours. The greater part, however, is eliminated during the first 24 hours, only small quantities being found in the urine later.

"The data herein presented lead to the conclusion that in the carnivora larger amounts of caffein are demethylated than in the herbivora, and that the resistance to caffein is inversely as demethylation, since it has been shown that caffein is much more toxic for carnivora than herbivora. The mechanism of demethylation is in all probability utilized in the body as a means of defense against the deleterious action of caffein, being more active in organisms for which the drug is more toxic."

A bibliography is appended.

Studies on water drinking.—XIII, Hydrogen ion concentration of feces, P. E. Howe and P. B. Hawk (*Jour. Biol. Chem., 11 (1912), No. 2, pp. 129–140*).—The hydrogen concentration of the feces of 2 men was determined in a water drinking experiment, and of 1 man in a fasting experiment, with the usual preliminary and final periods.

"The reaction of the feces was uniformly alkaline, the hydrogen ion concentration varying between 0.15×10^{-8} and 9.8×10^{-8}. As the result of water drinking with meals there was a tendency for the hydrogen ion concentration to increase. Pronounced changes in the dietary régime, such as high protein, low protein and fasting, did not affect the hydrogen ion concentration of the feces sufficiently to cause other than small variations in the uniformly alkaline reaction. As the result of fasting, the stools were alkaline in reaction (hydrogen ion concentration of 1.4×10^{-8} and 0.94×10^{-8}) as opposed to the acid stools reported by previous investigators. The hydrogen ion concentration differs for the feces of different individuals living on the same diet."

Earlier work has been previously noted (E. S. R., 27, p. 168).

Fasting studies.—VI, Distribution of nitrogen during a fast of one hundred and seventeen days, P. E. Howe, H. A. Mattill, and P. B. Hawk (*Jour. Biol. Chem., 11 (1912), No. 2, pp. 103–127, fig. 1*).—In general, the percentage of nitrogen distribution was similar to that reported by the authors in connection with shorter fasting studies with dogs (E. S. R., 26, p. 360).

Fasting studies.—VII, The putrefaction processes in the intestine of a man during fasting and during subsequent periods of low and high protein ingestion, C. P. Sherwin and P. B. Hawk (*Jour. Biol. Chem., 11 (1912), No. 3, pp. 169–177*).—Continuing the above experiments, the present investigation was conducted with a normal man weighing 76 kg. to study the influence of fasting, and a subsequent feeding of low and high protein diets upon the course of intestinal putrefaction. The authors summarize the work as follows:

"Intestinal putrefaction as measured by the output of urinary indican was markedly decreased during the fasting interval. The seventh fasting day showed an indican excretion amounting to 13.7 mg. as against an output of 60.5 mg. for the second fasting day. During the postfasting interval of low protein ingestion putrefaction was increased in a very pronounced manner, the indican values rising far above those obtained during the normal period preceding the fast. The average daily indican output was but slightly higher during the period of high protein ingestion than during the low period.

"The indican data for the preliminary period, when taken into consideration in connection with other similar data collected previous to certain tests upon the influence of a high water ingestion, furnish an important verification of a conclusion previously reported from this laboratory to the effect that 'the drinking of copious or moderate volumes of water with meals decreases intestinal putrefaction as measured by the urinary indican output.'

"It was demonstrated that intestinal putrefaction was 50 per cent greater when but 5.23 gm. of nitrogen was passed into the gastro-intestinal tract after the fast than it was when 21.86 gm. of nitrogen was ingested before the fast.

"Data from this and previous experiments along similar lines made upon [one of the subjects] seem to indicate that there is of necessity no uniform relationship between the urinary indican excretion and the output of bacteria in the feces, even when the diet of the subject is of the same general character.

"The indican value for the high protein period subsequent to the fast was approximately 60 per cent higher than the indican value for the preliminary period, notwithstanding the fact that the ingested diet was identical in kind and quantity in the two instances.

"On the seventh day of fasting approximately 40 per cent of the total quantity of ethereal-SO_3 excreted in the urine was in the form of indican-SO_3, whereas only about 10 per cent was excreted in this form in the urine of the fourth fasting day."

An experiment on a fasting man, F. G. BENEDICT (*Science, n. ser., 35 (1912), No. 909, p. 865*).—A brief note is given regarding a 31-day experiment during complete fasting. Many factors, including those measurable with the respiration calorimeter, were taken into account.

The interstitial granules of striated muscle and their relation to nutrition, E. T. BELL (*Internat. Monatsschr. Anat. u. Physiol., 28 (1911), No. 10–12, pp. 297–347, pl. 1; abs. in Zentbl. Biochem. u. Biophys., 13 (1912), No. 3, p. 92*).—The interstitial granules of striated muscles of mammals were found to consist chiefly of liposomes. Neither fatty acids nor soaps were found.

During fasting the liposomes disappear from the muscle and appear again on feeding. In the case of the frog an increase of these bodies is noticed at the beginning of summer and a decrease in autumn. When rats are fed fat meat a marked increase in liposomes is noted and a deepening of their color. The author believes that the liposomes are not cellular organs but fat depositories.

An extended bibliography is included.

Idiosyncrasy and anaphylaxis (*Med. Rev. of Reviews, 18 (1912), No. 6, pp. 366, 367*).—The data here summarized indicate that idiosyncrasies observed in individuals with respect to different articles of diet may be attributable to hyper-susceptibility to the toxic action of proteids or other material.

The respiration calorimeter and its uses for the study of problems of vegetable physiology, C. F. LANGWORTHY and R. D. MILNER (*Jour. Biol. Chem. 11 (1912), No. 2, Proc., p. xxxiii*).—A brief account is given of the use of the respiration calorimeter (E. S. R., 25, p. 570) for the study of problems concerned with ripening fruit and of the construction of a new calorimeter specially designed for use in the study of such problems.

Nutrition laboratory, F. G. BENEDICT (*Carnegie Inst. Washington Year Book, 10 (1911), pp. 183–197*).—A brief description is given of the equipment, investigations in progress, publications, and work of the laboratory in general.

ANIMAL PRODUCTION.

The influence of selection and assortative mating on the ancestral and fraternal correlations of a Mendelian population, E. C. SNOW (*Proc. Roy. Soc. [London], Ser. B, 85 (1912), No. B 578, pp. 195, 196*).—"In general terms, it was established that the effect of taking a selected sample instead of a random one from a population showing a zero coefficient of assortative mating would be to find the ancestral and fraternal correlations within that sample less than those of a random sample, so long as the variability was diminished by the selection. If an ancestor be selected, the correlations between that ancestor and descendants diminish in geometrical progression. On the whole, selection of parents appears to affect the correlations between them and their offspring to a greater extent than it affects the relationship between those offspring them-

selves. For all ancestral cases the regressions appear to be more stable properties of a particular population than the corresponding correlations; frequently the regression of offspring on ancestor is the same as for a random sample, though the correlation is changed. . . .

"The value 0.5 in each case for the fraternal and parental correlations obtained when random samples of a general Mendelian population are dealt with does not depend upon the fact that the samples are random ones, but upon the fact that for such a population the frequency of the heterozygote is twice the geometric mean of the frequencies of the dominant and recedent homozygotes. For, if any selected sample of the form $p_1^2(AA)+2p_1q_1(Aa)+q_1^2(aa)$ be taken from the general population $p^2(AA)+2pq(Aa)+q^2(aa)$, the parental and fraternal correlations reached when the individuals of the selected sample mate at random within the sample always have the constant value 0.5. . . .

"Assortative mating within a random sample of the general population, if positive, increases the parental and sibling regressions as well as the correlations. The ancestral regressions diminish in geometrical progression, the correlations not perfectly, but nearly so. In certain cases the expressions found for the parental and sibling correlations were identical with those reached by the very general methods previously employed by Pearson, and which have no connection whatever with Mendelism, but this can hardly be more than a curious coincidence.

"[In] assortative mating within a selected sample, the regression of offspring on parent depends upon both the assortative mating and the intensity of selection, and increases as those factors increase. Selection and assortative mating affect the correlations in opposite directions, the decreasing tendency of the former appearing to have the predominating effect in practical cases. The sibling correlation is not raised so much by assortative mating nor reduced so much by selection as is the parental one.

"Fairly similar qualitative results were found throughout for somatic characters, though not so much weight can be given to them as to those for gametic characters. Moreover, it is the latter which agree most closely with observation. It is to the results for gametic characters, therefore, that we must look for theoretical verification for experimental conclusions which, at first sight, appear paradoxical, e. g., the closeness of the resemblance between cousins."

See also a previous article (E. S. R., 27, p. 175).

Mendel's principles of heredity, A. H. MARSH (*Jour. East Africa and Uganda Nat. Hist. Soc., 2 (1911), No. 3, pp. 52–60, pls. 2*).—A popular exposition of Mendel's law, with special reference to applying it to the improvement of domesticated animals in East Africa.

Concerning the inheritance and the origin of species, J. GROSS (*Biol. Centbl., 31 (1911), Nos. 6, pp. 161–177; 7, pp. 193–214; abs. in Zentbl. Allg. u. Expt. Biol., 2 (1912), No. 24, pp. 641, 642*).—A criticism of the extreme views of the Mendelians.

On the changes in the cranial capacity caused by domestication, B. KLATT (*Sitzber. Gesell. Naturf. Freunde Berlin, 1912, No. 3, pp. 153–179, figs. 9*).—Measurements of skulls of wild and domesticated animals are given, with a discussion of the changes that have taken place. The cranial capacity of domesticated sheep, swine, and dogs was found to be smaller than that of closely related wild species.

The inheritance of the dun coat color in horses, J. WILSON (*Sci. Proc. Roy. Dublin Soc., n. ser., 13 (1912), No. 14, pp. 183–201*).—Additional data (E. S. R., 23, p. 476) are cited as a further illustration that dun is recessive to gray and roan, and dominant to brown, bay, black, and chestnut.

The nature of the inheritance of horns in sheep, T. R. Arkell and C. B. Davenport (*Science, n. ser., 35 (1912), No. 911, p. 927*).—An explanatory note concerning the work of Castle previously noted (E. S. R., 27, p. 370).

Is there association between the yellow and agouti factors in mice? A. H. Sturtevant (*Amer. Nat., 46 (1912), No. 546, pp. 368–371*).—Evidence is submitted to show that the ticking or the agouti factor is closely associated with the factor which produces yellow-haired mice.

Evidence of the zebra in the pleistocene fauna of France, S. Trotter (*Science, n. ser., 33 (1911), No. 849, p. 530*).—A study of the drawings in L'Art pendant L'Age du Renne, by Edouard Piette (Paris, 1907), leads the author to believe that the zebra lived in western Europe as a contemporary of the cave bear, woolly rhinoceros, and other animals depicted by paleolithic man.

Some current conceptions of the germ plasm, R. A. Harper (*Science, n. ser., 35 (1912), No. 911, pp. 909–923*).—This is an address made before the American Association for the Advancement of Science, 1911, and in which the recent studies on fundamental problems of cell behavior and heredity are reviewed. The author finds that the later researches strengthen the view that chromosomes are the bearers of hereditary traits, but that the attempt to express the results in terms of unit characters is but a relic of the earlier corpuscular and preformational theories of heredity.

On melanin, R. A. Gortner (*Biochem. Bul., 1 (1911), No. 2, pp. 207–215*).—A summary of work, wherein it is pointed out that the work of different investigators is not comparable because of the diversity of methods. The following conclusions are drawn:

"All available data indicate that the formation of melanin is brought about by the interaction of an oxidase and an oxidizable chromogen. Melanins are of at least 2 types, which may be differentiated by their solubility or insolubility in dilute acids. Those melanins which are soluble in dilute acids are of a protein nature, and for this type the name melano-protein is suggested. It appears probable that these melano-proteins are not present as granules, but that they are 'dissolved' in the keratin structure. The melanins which are insoluble in dilute acids are of an unknown constitution, and are, probably, the 'pigment granules' which may be seen in the hair and tissues. It is probable that they are formed by the oxidation of a different chromogen from that which yields the melano-proteins. The protein portion of the melano-protein molecule is readily decomposed by the action of alkalis or acids, and colored products are obtained which are not soluble in dilute acids. Tyrosin, lysin, and arginin have been identified among the hydrolytic products of a melano-protein. Sodium hydroxid solution decomposes the melanin molecule, and causes a loss of both nitrogen and hydrogen. As many different products as may be desired can be obtained by varying the strength of the alkali employed."

The origin of the melanotic pigment in the embryonic eye and in malignant tumors, A. von Szilly (*Arch. Mikros. Anat., 77 (1911), No. 2, I, pp. 87–156, pls. 4; abs. in Jour. Roy. Micros. Soc. [London], 1912, No. 2, pp. 168, 169*).—The author studied the eyes of several vertebrate embryos and melanotic tumors in the eye of man. The pigment bearers were found to arise from the chromatin of the nucleus and pass into the cytoplasm, being comparable to chromidia. Some are of a degenerative type, and their appearance is associated with a partial breakdown of the nucleus. The change of colorless pigment bearers into pigment is brought about by specific cell ferments, which act on the chromatin.

On melanin of animal origin, M. Piettre (*Compt. Rend. Acad. Sci. [Paris], 153 (1911), No. 17, pp. 782–785; abs. in Chem. Ztg., 35 (1911), No. 144, p.*

1335).—From the sarcomatous tumors in horses the author isolated by acid hydrolysis a protein fraction and a more condensed jet-black nucleus insoluble in acids but easily soluble in alkalis.

American Society of Animal Nutrition (*Amer. Soc. Anim. Nutrition Proc. 1911, pp. 37*).—This contains the minutes of the annual meeting held in November, 1911 (E. S. R., 26, p. 197), including the president's annual address on Some Unsolved Problems, by H. P. Armsby (pp. 4–12), and the following papers; Methods in Nutrition Investigation, by E. B. Forbes (pp. 12–21); The Feeding Experiment: Its Improvement and Refinement, by H. J. Waters (pp. 21–28); and Animal Nutrition Investigations in the Bureau of Animal Industry, by G. M. Rommel (pp. 28–30).

Analyses of fodder plants, grasses, and root crops, J. C. Brünnich (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1909–10, pp. 58–60*).—Analyses are reported of Early Amber cane, *Sorghum saccharatum*, white and red Kafir corn, *Andropogon intermedius*, *A. affiis*, *Anthistiria avenacea*, *A. ciliata*, *Panicum bulbosum*, spring grass (*Erichloa punctata*), *Trysacum dactyloides*, *Erodium cygnorum*, *Atriplex halimoides*, *Medicago sativa*, *Lotus australis*, oaten chaff, oil cake, imphee silage, cowpea and sorghum silage, turnips, kohl-rabi, swedes, mangolds, carrots, sugar beets, and kangaroo grass.

[Analyses of feeding stuffs], H. H. Mann (*Ann. Rpt. Dept. Agr. Bombay, 1910–11, p. 62*).—Analyses of several new fodders are reported, which include the following: Babul pods, water 5.5, ether extract 2.2, protein 11.63, soluble carbohydrates and tannin 59.3, fiber 16.47, and ash 4.9 per cent; and rice konda, water 8.23, ether extract 8.54, protein 32.89, soluble carbohydrates 37.72, fiber 4.9, and ash 7.72 per cent.

The rice konda consisted chiefly of the inner husk and germ obtained in grinding rice. It is thought that babul would form a nutritious fodder, except those varieties containing so large an amount of tannin that they are not relished by stock.

Inspection and analyses of commercial feeding stuffs on sale in the State, W. F. Hand et al. (*Mississippi Sta. Buls. 153, pp. 31; 154, pp. 39*).—Analyses are reported of wheat shorts, bran and middlings, corn chop, hominy feed, rice polish, rice bran, molasses feeds, and mixed feeds.

Concentrated commercial feeding stuffs, A. L. Garrison (*Tenn. Agr., 1 (1912), No. 2, pp. 35–73*).—Analyses are reported of alfalfa meal, wheat bran and shorts, linseed meal, cotton-seed meal, and proprietary mixed feeds.

Molasses and molasses feeds.—Composition and feed values of rice by-products, J. E. Halligan (*Baton Rouge: La. Bd. Agr. and Immigr., [1912], pp. 20, fig. 1*).—This is a popular discussion of the feeding value of molasses and rice by-products. Samples of rations for different farm animals are given.

Animal breeding, G. Wilsdorf (*Tierzüchtung. Leipsic, 1912, pp. 110, pls. 12*).—This is a brief popular treatise on the feeding, breeding, and management of all kinds of live stock.

Cattle in Latin America, P. Bergés (*Trab. 4. Cong. Cient. Santiago de Chile, 15 (1908–9), pp. 508–512, pls. 2*).—This contains live stock statistics of the Latin American countries.

The live-stock industry in the Department of Junin, A. L. García (*Bol. Dir. Fomento [Peru], 9 (1911), No. 5, pp. 1–44*).—It is stated that this region is better adapted to sheep raising than to cattle raising. Data are given as to the amount of wool exported from Peru to different countries from 1903 to 1909, and the amount, value, and origin of imports of condensed milk, butter, and cheese during the years 1904 to 1909.

The meat industry of Argentina, J. E. Richelet (*An. Soc. Rural Argentina, 46 (1912), No. 2, pp. 160–201, figs. 28*).—A general and statistical article,

Official enumeration of cattle in the Canton of Bern (*Mitt. Bern. Statis. Bur., 1911, No. 3, pp. 92*).—This gives in detail the statistics of all kinds of live stock in Bern.

Live stock and products thereof (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1909–10, pp. 15–19, 135–148*).—This contains general and statistical information on the live-stock industry in Queensland.

[Defrosting beef and mutton] (*Agr. Gaz. N. S. Wales, 23 (1912), No. 3, p. 239*).—A brief description of a process by which frozen meat is thawed in a chamber so constructed that the atmospheric pressure can be regulated and excess moisture extracted without breaking the tissues of the meat. It is claimed that beef and mutton thus treated compare favorably in appearance when placed on the market with prime English meat.

[British meat supplies], J. L. GRIFFITHS (*Daily Cons. and Trade Rpts. [U. S.], 15 (1912), No. 121, pp. 722, 723*).—This contains statistics on imports of beef, mutton, and pork from different countries, showing how the decrease in imports of meat from the United States to Great Britain has been replaced by shipments from Argentina.

An industry that thrives on the utilization of waste, E. SCHERUBEL (*Sci. Amer., 106 (1912), No. 24, pp. 538, 549–552, figs. 6*).—A popular account of the use made of the by-products of the packing house.

Hides and sheepskins, E. J. SHELTON (*Agr. Gaz. N. S. Wales, 23 (1912), No. 4, pp. 297–306, pls. 3, fig. 1*).—This contains advice on skinning, curing, and marketing hides.

Sheep raising in southern Chile (*Times [London], 1911, June 27, So. Amer. Sup. No. 12, p. 34; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 8–10, p. 2200*).—A general and statistical account of the rapidly growing sheep industry in the southern part of Chile, which until recently was regarded as a desert.

Sheep and wool for the farmers, J. W. MATHEWS (*Agr. Gaz. N. S. Wales, 23 (1912), No. 3, pp. 185–207*).—Besides a general discussion of the cross-bred *v.* the Merino, there is an account of the results obtained thus far at the Wagga experimental farm.

The pastoral age in Australasia, J. COLLIER (*London and Melbourne, 1911, pp. XI+345, pls. 16*).—A popular history of the sheep industry in Australia.

The economic importance of the South American Camelidæ, D. DAVEL (*Trab. 4. Cong. Cient. Santiago de Chile, 15 (1908–9), pp. 234–240*).—This discusses the value of the llama, alpaca, vicuña, and guanaco as domesticated animals.

Profitable pig breeding and feeding, T. ALLEN (*London, 1910, pp. XI+196, pls. 9, figs. 24*).—A practical treatise on the feeding, breeding, and management of swine, written for the purpose of promoting the industry in Great Britain.

Fattening hogs in Nebraska, W. P. SNYDER (*Nebraska Sta. Bul. 124, pp. 5–71*).—The material in this bulletin has been previously noted (E. S. R., 26, p. 874), additional technical details being here given.

Slaughter trials with swine, N. O. HOFMAN-BANG ET AL. (*Ber. K. Vet. og Landbohöjskoles Lab. Landökonom. Forsög [Copenhagen], 77 (1912), pp. 35*).—Transportation trials with pork were made in a refrigerator car and in a common freight car, with hay or sawdust mattresses 3 in. thick laid on the floor and placed around the walls of the car. The air temperature at the time of loading was 19.5° C. The temperature of the pork in the refrigerator car was 8.3° at loading and at the end of the journey. The average temperature of the pork when placed in the common freight car was 8.7°, and at the end of the 40-hour journey it had risen to 12.3°. For this limited period it is, therefore,

concluded that it is practical to ship pork in freight cars in the manner indicated.

Experiments are also reported with different methods of piling pork during the salting process, and with salting hard and soft pork. The latter trials show that soft pork takes up more brine by injection than hard pork, but during the salting process the soft pork shrinks more, so that there will be from ½ to over 2 per cent more salted hard than soft pork.

Pig clubs in England and Wales in 1910 (*Jour. Bd. Agr. [London], 19 (1912), No. 3, pp. 203–209*).—This contains data on the cooperative societies for insuring pigs. There are over 1,000 of these in England and Wales, 32 of which are registered.

Kemerton and Overbury pig club (*Jour. Bd. Agr. [London], 19 (1912), No. 3, pp. 209–214*).—Statistics are given of a cooperative society for insuring pigs which has been in operation for 25 years.

The feeding of the horse, E. Lavalard (*L'Alimentation du Cheval. Paris, 1912, pp. 164*).—A general treatise on this subject which gives recent results of investigations that can be applied by the practical horse feeder.

The Przewalskii wild horse, E. Weber (*Ztschr. Tiermed., 16 (1912), No. 5, pp. 179–192, fig. 1*).—A discussion of the characteristics of *Equus przewalskii*, which the author considers to be the sole ancestor of the domesticated horse. A bibliography is appended.

The half-bred in Ireland: Hunters, hacks, and army horses, E. Meuleman (*Le Demi-Sang en Irlande: Hunters, Hacks et Troupiers. Paris, 1910, pp. XI+139, pls. 32*).—An account of the past and present conditions of horse breeding in Ireland.

The Argentine polo ponies (*Country Life [London], 31 (1912), No. 806, pp. 19*, 20*, figs. 4*).—This discusses the type of Argentine ponies which has been recently introduced into England.

Certification of stallions, W. A. N. Robertson (*Jour. Dept. Agr. Victoria, 10 (1912), No. 5, pp. 288–315*).—This reports the results of the fifth stallion registration in Victoria, and also states the regulations under which the animals are registered.

Castration of the stallion standing by means of the ecraseur, J. J. Edgar (*Agr. Jour. Union So. Africa, 3 (1912), No. 4, pp. 486–491, figs. 6*).—Directions are given for castration, based on the results of many years' experience.

Cattle dogs and sheep dogs, R. Kaleski (*Dept. Agr. N. S. Wales, Farmers' Bul. 38, 1910, pp. 15, pls. 4*).—A discussion of the requirements of good cattle and sheep dogs, and a description of the varieties in New South Wales.

Proper temperature for artificial incubation, S. Covalt (*Rel. Poultry Jour., 19 (1912), No. 5, pp. 785, 832*).—The rectal temperature of the fowls examined was as follows: Cockerels, range 105.2 to 107°, with an average of 106.8°; laying hens and pullets, range 104.8 to 107.8°, average 106.6°; sitting hens, range 105 to 107.4°, average 106.1°. The inside temperature of eggs under a sitting hen at the end of 3, 6, 7, and 24 hours was 100°, at the end of a week 101°, at the end of 2 weeks 102.4°, and on the eighteenth day 102°. When a thermometer was hung on a hook in the incubator and kept at 103°, the inside temperature of the eggs after 24 hours' incubation was only 97°. When the thermometer was placed on the eggs and kept at 103°, the inside temperature of the eggs was approximately that of eggs under the hen.

"There is not much change in the temperature of the live chick in the egg after the end of the second week. And in the incubator the live chicks in the eggs showed an average of 102.4° at the end of the eighteenth day with the thermometer running at 103° on the eggs. I consider that the safest and best

place from then on for the thermometer would be hanging on hooks above the eggs and not more than ½ in. away from them, running a temperature of 103.5 to 104° at hatching time.

"These experiments bring us, I believe, as near as any possible way can to finding the proper temperature at which to run the incubator. One hen had a temperature of 105.4°, and I always found her eggs, on an average, 2° lower than the others. On examining the chicks in these eggs I found they, without exception, showed improper development."

Poultry keeping in Egypt, W. H. CADMAN (*Agr. Jour. Egypt, 1 (1912), No. 2, pp. 66–80*).—A brief summary of the poultry industry in Egypt as compared with that of other countries.

The long-tailed Japanese fowl, F. L. SEWELL (*Rel. Poultry Jour., 19 (1912), No. 5, pp. 775, 802, 803, figs. 9*).—A description of the characteristics of this breed of fowl. It is suggested that as the supply of plumage of wild birds is decreasing, it will be profitable to raise this fowl as the long plumes will find a ready sale with milliners.

Experiments with ostriches, J. E. DUERDEN (*Agr. Jour. Cape Good Hope, 37 (1910), No. 5, pp. 512–517; Agr. Jour. Union So. Africa, 1 (1911), Nos. 1, pp. 29–37, pls. 8; 3, pp. 348–351; 3 (1911), Nos. 1, pp. 22–29; 3, pp. 352–356, figs. 2; 4, pp. 492–507, figs. 5; 5, pp. 625–638, figs. 5*).—A continuation of earlier work (E. S. R., 24, p. 380).

The plumages of the ostrich, J. E. DUERDEN (*Ann. Rpt. Smithsn. Inst., 1910, pp. 561–571, pls. 8*).—This is a reprint of a portion of the work noted above.

Shellfish industries, J. L. KELLOGG (*New York, 1910, pp. XIII+361, pls. 16, figs. 33*).—A popular work on the oyster, soft clam, hard clam, and scallop, written for those interested in their culture or who may have an interest in the biological problems involved in their artificial control.

DAIRY FARMING—DAIRYING.

Report of the Fifth International Dairy Congress (*Compt Rend. 5. Cong. Internat. Lait. [Stockholm], 1911, pp. 176, pl. 1*).—This is a complete report of the proceedings and papers read at the International Dairy Congress, held at Stockholm, June and July, 1911.

Norwegian dairy industry, P. E. TAYLOR (*Daily Cons. and Trade Rpts. [U. S.], 15 (1912), No. 137, pp. 1041–1043*).—A brief report on the recent development of the dairy industry in the Stavanger consular district, where most of the creameries are on the cooperative plan and in a profitable condition. A large amount of cheese and butter is exported. The growth of the industry has opened the market for several kinds of American machinery, such as mowing machines, ensilage cutters, dairy appliances, etc.

The production of milk in Italy, BIGNAMI (*Villaggio, 36 (1911), No. 1826, p. 313; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 8–10, p. 2224*).—Information regarding the production of milk, butter, and cheese from cows, sheep, and goats in Italy.

Half yearly exports of milk and dairy products from Italy (*Statis. Import. e Esport. [Italy], 1911, Jan.–June, pp. 315; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 8–10, p. 2225*).—Data on milk, butter, and different varieties of cheese exported from Italy in the years 1909–1911.

[The dairy industry of Tasmania], H. D. BAKER (*Daily Cons. and Trade Rpts. [U. S.], 15 (1912), No. 128, p. 851*).—This contains notes on the present condition of the industry. At present about 53,000 cows are kept for dairy purposes. The output of the registered factories during the year ended June

30, 1911, was 2,815,680 lbs. of butter, valued at $611,719, and 423,920 lbs. of cheese, valued at $51,487. Most of this cheese and butter was sent to England, via Melbourne.

[Dairying] (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1909–10, pp. 24–31, 47, 63*).—This consists of reports on dairy legislation, inspection of dairy products, and testing glassware, and analyses of butter.

Results of the Douglas County cow testing association, A. L. HAECKER and J. H. FRANDSEN (*Nebraska Sta. Bul. 129, pp. 3–15, figs. 6*).—A summary is given of records of a cow-testing association which included 21 herds and 435 cows. Comparisons are drawn between the best and the poorest cows in each herd. The 10 most profitable cows showed a total profit of $1,032.88, as compared with $57.82 made by the 10 poorest cows. One cow returned only 55 cts. for each dollar of feed consumed. The best cow returned $4.17.

Cooperative cow insurance societies in 1910 (*Jour. Bd. Agr. [London], 19 (1912), No. 2, pp. 116–124*).—This reports the number of members, number of animals insured, amount of claims paid, and other data of the 22 cooperative cow insurance societies in England and Wales.

Hand milking, and method of reducing and regulating, P. BERGÉS (*An. Soc. Rural Argentina, 46 (1912), No. 2, pp. 127–159, figs. 18*).—A discussion of the advantages of using milking machines, based principally on the results of their use in foreign countries.

On the cost price of milk in France (*Rev. Sci. [Paris], 49 (1911), II, No. 13, p. 409; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 8–10, p. 2223*).—The average cost of milk production in the Department of Yonne is stated to be 0.215 franc per liter (about 3.9 cts. per quart) for small herds and 0.188 franc per liter for large herds.

Milk in India, R. J. BLACKHAM (*Jour. Roy. Army Med. Corps, 16 (1911), No. 2, pp. 187–191*).—The average of 402 analyses of cow's milk gave the following results: Specific gravity 1.03244, total solids 13.393 per cent, and fat 4.286 per cent. Buffalo's milk was found to contain less fat than most of the analyses which have been previously reported. The average of the analyses of 124 samples resulted as follows: Specific gravity, 1.03404, total solids 15.98, and fat 5.98.

The influence of freezing on the composition of milk, C. MAI (*Molk. Ztg. Berlin, 22 (1912), No. 18, pp. 207, 208; N. Y. Produce Rev. and Amer. Cream., 34 (1912), No. 6, p. 262*).—Chemical and physical constants of a number of tests with frozen milk are reported.

In one case a 10-qt. can, kept at a temperature of 21° F. from 6 p. m. to 8 a. m., formed a layer of ice on the inside about the thickness of a finger. The can was then closed and left until the next morning. The upper layer was frozen "foamy leafy," and could be removed with a spoon. After about 4 qt. of the unfrozen liquid in the center was withdrawn, as well as the upper layer, the ice coat on the sides was thawed at 68°, and all remixed. The results of analyses are given in the following table:

Chemical and physical constants of milk partially frozen at 21° F.

	Specific gravity.	Refraction number.	Fat.	Solids-not-fat.	Acidity.
			Per cent.	*Per cent.*	*Per cent.*
The original milk	1.0317	38.5	3.4	8.87	6.5
Upper loose ice	1.0233	37.5	11.1	8.57	.....
Solid ice on sides	1.0165	28.0	3.2	4.92	.....
Liquid in the center	1.0534	52.2	2.0	13.85	.....
All remixed	1.0321	38.5	3.3	8.95	7.3

In another case the milk was chilled to 32°, and placed in the open air at a temperature of from 4° above to zero for 30 hours. A small sample was kept unfrozen in an ice-box to control the acidity. The can appeared as before, and after separating and testing the various parts they were left for 3 days at about 39° to thaw and be remixed. The results were as follows:

Chemical and physical constants of milk partially frozen at 4° F.

	Specific gravity.	Refraction number.	Fat.	Solids-not-fat.	Acidity.
			Per cent.	*Per cent.*	*Per cent.*
Original milk	1.0318	38.6	3.7	8.94	6.2
Upper layer (0.6 qt.)	1.0256	40.2	11.6	9.30	8.2
Liquid center (2.5 qt.)	1.0534	53.5	3.3	14.17	11.0
Solid ice on sides (7 qt.)	1.0201	30.1	2.9	5.75	3.8
Remixed	1.0320	38.7	3.6	8.97	7.2
Unfrozen control		38.6			7.0

The milk was not changed by freezing in any manner perceptible to smell or taste, nor to the peroxydase reaction. The author warns the police inspectors to be careful in taking samples of milk in frosty weather, and suggests prohibiting the sale of partially frozen milk.

[A froth dispeller] (*Dairy, 23 (1911), No. 276, p. 325, fig. 1; N. Y. Produce Rev. and Amer. Cream., 33 (1912), No. 21, p. 884*).—A description is given of a centrifugal machine for separating air from milk and milk froth.

In appearance it resembles the Alfa separator. The milk in its attempt to leave the bowl encounters paddle-shaped ribs in the space between the disks and is sent through this space in a thin layer out of the bowl into the cover, which it leaves by an outlet therein. The air which is separated from the milk escapes from the bowl by passing out of the bottom disk and ascends into the atmosphere. As the milk leaves the machine at a considerable force it can be elevated, if desired, over a cooler without the aid of a pump. The air is prevented from issuing with the milk by means of a regulating tap attached to the milk outlet pipe.

When separating pasteurized milk the froth dispeller is arranged to receive the milk from the pasteurizer and feed it to the separator. When cooling pasteurized milk the froth dispeller receives the milk from the pasteurizer and elevates it over the cooler.

Is it a menace to humans to drink milk obtained from cows affected with tuberculosis of the udder? E. UNGERMANN (*Tuberkulose Arb. K. Gsndhtsamt., 1912, No. 12, pp. 213–264*).—In some cases no traces of tuberculosis could be found in people who were accustomed to use tuberculous milk, though in other instances the results were affirmative. The conclusion is reached that tuberculous milk is a source of infection, but that a still greater danger is the contraction of the disease from human tuberculous patients.

Report from the bacteriological department, 1911–12, J. GOLDING and W. SADLER (*Midland Agr. and Dairy Col. Bul. 8, 1911–12, pp. 67–78*).—This consists of brief notes on defects of milk and milk products.

Bacillus lactis viscosus was found to be the cause of a sample of ropy milk. A copper taint in milk was due to the use of a cooler from which the tin had been largely worn off. A burnt taste in milk was traced to the presence of *Bacterium lactis acidi*. Milk sold as sterilized had turned yellow and was found to contain a spindle-shaped organism, forming large spores quite resistant to heat. A yellow discoloration of Stilton cheese was ascribed to the presence of an abnormal amount of tyrosin.

South Italian cheeses, C. BESANA (*Ann. R. Staz. Sper. Caseif. Lodi, 1910, pp. 49–78; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 8–10, pp. 2230, 2231*).—Descriptions are presented of the principal varieties of cheese as made in southern Italy.

The most popular variety is Pecorino, made of ewe's milk. Among the types of cow's milk cheeses are Provolone, a good table cheese, Caciocavallo, which is often used for grating, and Scamorze, a small salted cheese, which is consumed locally. Although good cheeses are made for home consumption, they are not an important commercial product. Provature, or Provole, and Mozzarelle cheeses are made from buffalo milk. Many cheeses from mixed milk are made and consumed locally. Manteche is whey butter, covered with a thin layer of cheese.

Yellow discoloration of Stilton cheese, J. GOLDING (*Jour. Bd. Agr. [London], 19 (1912), No. 3, pp. 177–186, pl. 1*).—This discusses the losses caused by a yellow discoloration of Stilton cheese, and reports the results of the investigations to determine the cause.

Twenty-four cheeses were made under control conditions, with the result that those containing a large amount of salt seemed to favor the yellow discoloration, but evidently this was not the only factor. Negative results were obtained with pure cultures of bacteria. The injection of tyrosin into the normal cheeses produced discoloration, and therefore is thought to be the limiting factor. Salt is also thought to favor the accumulation of tyrosin because it retards the action of enzyms that might destroy tyrosin formed during ripening. To avoid this defect cleanliness should be observed, especially in the preparation of the rennet, so that unfavorable types of bacteria or other active agents which influence the formation of tyrosin may be excluded.

VETERINARY MEDICINE.

Report of the veterinarian for the State of Pennsylvania, S. H. GILLILAND (*Ann. Rpt. Penn. Dept. Agr., 16 (1910), pp. 136–195*).—This is a report for the year 1910 with reference to the meat inspection service, meat markets, slaughterhouses, diseases of live stock, a report of the bacteriological laboratory, results obtained in the eradication of tuberculosis (noted on page 481), the diagnosis of rabies (noted on page 479), and microscopical examinations of miscellaneous materials.

Annual report for 1911 of the principal of the Royal Veterinary College, J. MCFADYEAN (*Jour. Roy. Agr. Soc. England, 72 (1911), pp. 347–362*).—The diseases reported upon are anthrax, glanders, hog cholera, foot-and-mouth disease, parasitic gastritis in sheep, and tuberculosis.

Annual report of the Punjab Veterinary College and of the Civil Veterinary Department, Punjab, for the year 1910–11, S. H. GAIGER and V. DE V. H. WOODLEY (*Ann. Rpt. Punjab Vet. Col. and Civ. Vet. Dept., 1910–11, pp. 14+XII*).—This annual report includes accounts of the occurrence of equine and bovine contagious diseases, breeding operations, etc.

Report of the government bacteriologist, C. J. POUND (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1910–11, pp. 62–68, pl. 1*).—This report consists largely of a discussion of tick fever and its prevention by inoculation. The parasite *Onchocerca gibsoni* is reported to have been found during the early part of the year in sheep, an animal which hitherto was not suspected of harboring this parasite.

Surgical and obstetrical operations, W. L. WILLIAMS (*Ithaca, N. Y., 1912, 3. ed., rev. and enl., pp. XII+240, pls. 40, figs. 18*).—A third revised and enlarged edition of this work (E. S. R., 15, p. 719).

Practical and scientific horseshoeing, F. G. CHURCHILL (*Kansas City, Mo., 1912, pp. 127, pls. 7*).—A small handbook.

Subject and author index to Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten, E. RIEHM (*Centbl. Bakt. [etc.], 2. Abt., General-Register für die Bände 21–30. Jena, 1911, pp. 393*).—This is the author and subject index of this publication for volumes 21 to 30, inclusive.

The bacterial cell, A. MEYER (*Die Zelle der Bakterien. Jena, 1912, pp. VI+285, pl. 1, figs. 34*).—This is a comparative and critical compilation of the knowledge in regard to the bacterial cell, and is meant for botanists, zoologists, and bacteriologists.

On the transmission of immunity from mother to offspring.—A study upon serum hemolysins in goats, F. W. FAMULENER (*Jour. Infect. Diseases, 10 (1912), No. 3, pp. 332–368*).—"To summarize briefly the principal results of the experiments, it was found that goats actively immunized against sheep blood corpuscles during gestation passively transmitted the specific hemolysin to their young. Colostrum was the chief agent in bringing about the passive immunization of the suckling. Sucklings which got the colostrum and first milk rapidly acquired a relatively high antibody content in their blood, which was well retained. When the immunization was done during the period of gestation the colostrum contained a high content of specific hemolysin, often much higher than the adult's serum at time of parturition. The hemolytic antibodies rapidly disappeared from the milk after the mother had been suckled by the young. The blood taken from the newly born before they were permitted the antibody colostrum showed no appreciable amount of hemolysin by the test used. The placenta played a minor rôle in the passage of hemolysins to young before birth, practically negligible in most cases. Mother goats, actively immunized against sheep-blood corpuscles immediately after birth of their young, failed to transmit any demonstrable immunity to their suckling young. The milk, in some cases, contained no demonstrable hemolysins, but in others showed fairly large amounts. Apparently a very high degree of immunity is necessary before appreciable amounts of antibodies are excreted through the milk. Older sucklings apparently did not absorb the antibodies in an unchanged condition. The young animals (kids) did not respond to any extent in production of hemolysins following subcutaneous injections of foreign blood cells (sheep)."

The production and valuation of curative sera, K. E. BOEHNCKE (*Ztschr. Angew. Chem., 25 (1912), No. 18, pp. 865–870*).—A simple and concrete discussion of the facts pertaining to the production and testing of curative sera.

The optical method and its use in serum diagnosis, H. MIESSNER and K. B. IMMISCH (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 4 (1912), No. 3, pp. 160–187, fig. 1*).—This is a study of the optical behavior of normal and abnormal sera from various animals. The changes produced in the rotation as observed in the polariscope by silk-normal serum and glanders serum peptones and glanders bacilli extracts in a mixture with the serum of diseased horses were very atypical and did not greatly differentiate themselves from the value obtained for the sera from normal animals. Therefore the optical method is not considered an efficient method for diagnosing disease, especially where glanders is concerned and peptone mixtures are employed.

Dipping and tick destroying agents, H. WATKINS-PITCHFORD (*Agr. Jour. Union So. Africa, 2 (1911), No. 1, pp. 33–79, pls. 2, figs. 4*).—This is a report of dipping experiments, etc., with the brown tick (*Rhipicephalus appendiculatus*), which transmits the virus of East Coast fever, conducted in continuation of those previously noted (E. S. R., 24, p. 393). The investigations reported include the following subjects: Shortest periods for engorgement of the larva

and nymph of the brown tick; details of adjustment of the 3-day dip; lethal effects of 3-day and laboratory dips on distended female brown ticks; the effect of 3-day dip at intervals of 72 hours upon adult tick life generally; the lethal effect of dips ($\frac{1}{2}$ and $\frac{5}{12}$ strengths) at intervals of 48 hours, showing the increase of efficiency resulting from the addition of soap and paraffin; details for preparation of 3-day dipping fluid; details for preparation of 3-day ear dressing; tick migration experiment; relative tick activity during day and night; residual effect of 3-day dip in horses and cattle; the agency of the tail tuft in the collection of ticks; the suitability of 3-day dip in the treatment of scab in sheep; effect of weekly dipping process with laboratory dip upon secretion of milk; and a description of the isometer devised by the author for use in the estimation of the exact percentages of arsenic present in different samples of dipping fluid.

On the blood parasites found in animals in the zoological gardens during the four years 1908–1911, H. G. PLIMMER (*Proc. Zool. Soc. London, 1912, II, pp. 406–419, pls. 7*).—During a period of 4 years the author examined the blood of every mammal, bird, reptile, and batrachian, which died in the zoological gardens, a total of 6,430 individuals. Blood parasites were found in 447, or about 7 per cent; these animals representing 256 species. The results are reported in detail.

Amebæ as the cause of disease in domestic animals, E. LEHMANN (*Centbl. Bakt. [etc.], 1. Abt., Orig., 62 (1912), No. 7, pp. 589–605, figs. 14*).—A brief review first presented is followed by a report of studies of amebic dysentery in the horse, amebæ in the walls of the fore-stomachs of bovines, and amebæ colonies in the intestines of sheep. A bibliography of 61 titles is appended.

A contribution to the pathogenesis of B. abortus, Bang, II, M. FABYAN (*Jour. Med. Research, 26 (1912), No. 3, pp. 441–487, pls. 7*).—In the first part of this paper (E. S. R., 26, p. 586) the author presents a historical review of investigations of the etiology of contagious abortion. A report of investigations of the disease produced by inoculating guinea pigs follows.

"*Bacillus abortus* may be said to cause lesions in guinea pigs of a practically constant and most remarkable character. These usually appear between the third and sixth week (within 10 days as determined in sections by the microscope), the acute changes extending over a period of 10 to 20 weeks, after which reparative processes appear. The disease is accompanied by fever and tends toward final recovery, though the animal may die from rupture of the spleen, emaciation, and exhaustion.

"All the tissues of the body may be attacked with the exception of the muscles. This universality and frequency is best seen in sections under the microscope, as only the far advanced lesions are recognized by the unaided eye. In the tissues involved and in the histological changes produced, the disease closely resembles tuberculosis. The lesions have a predilection for the perivascular and subcapsular regions of the various organs. Injections cause at first a profound disturbance of the circulation in certain organs, notably the spleen, which becomes enormously engorged. Intra-abdominal inoculations are frequently followed by adhesions about the spleen. The localization of the disease in the testicle as well as in other organs, even when *B. abortus* is inoculated subcutaneously, is quite remarkable. The proliferation of bone although not common is extraordinary when present."

Inoculations led the author to conclude that it is highly probable that *B. abortus* produces lesions in mice.

The cultivation of *B. abortus* is described at length: "The cultural characteristics of this organism are quite constant when once its ability to grow on artificial media has been established. Among these characteristics may be

mentioned the glistening iridescent colonies on agar and the variation in their size; the colonies on and the nonliquefaction of gelatin; the slow growth in bouillon; the conspicuous pigmented growth on potato; and the organism's inability to ferment dextrose, saccharose, or lactose, or to produce acid."

Infectious abortion in bovines, ZWICK (*Deut. Tierärztl. Wchnschr., 19 (1911), No. 51, pp. 781–785; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 5 (1912), No. 1, p. 855*).—This work, a portion of which has been previously noted (E. S. R., 24, p. 785), shows that the serum of cows which have aborted, taken at the time or shortly after, will agglutinate in a titer of from 1:100 to 1:10,000, while normal animals' serum will never agglutinate over a titer of 1:100. A complement fixation test is obtained with the serum of cows which aborted, in amounts of from 0.01 to 0.001 cc., while the serum of normal animals requires amounts varying from 0.02 to 0.1.

As the abortion bacillus when taken with the food will also produce specific antibodies, and the immune bodies remain for a long time in the serum, this finding will only show that the animals are or were infected. Abortin prepared according to procedures used for producing tuberculin does not yield constant results. It is possible to produce highly active immune serum, and active immunization is possible, although the author believes it is a good procedure to combine the active immunization process with immune serum injections.

Contribution to Ascoli's precipitant diagnosis of anthrax, F. RUPPERT (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 4 (1912), No. 3, pp. 243–247*).—After pointing out the fact that Ascoli's serum often gives a slight ring when testing with material free from anthrax, as noted by Markoff (E. S. R., 27, p. 182), the author reports several cases in which a negative reaction was obtained with positively anthracic material. The method could not be employed for detecting anthrax bacteria or spores in foodstuffs.

Tests and observations of methods for combating foot-and-mouth disease, E. KRONACHER (*Deut. Landw. Tierzucht, 16 (1912), No. 11, pp. 122–124*).—The preparations used in these tests were Krafft's vaccine (for protective and curative treatment), Hoffmann's euguform (for treating animals already diseased), euformal, which is a chemical combination of 18 per cent of formaldehyde and 82 per cent of dextrin (for preventing infection), antiformin, pyoktanin, acetic acid and clay, and mitisol. None of these preparations gave very satisfactory results, with the possible exception of pyoktanin, which when used in connection with acetic acid and clay, gave fair results.

Serum diagnosis of glanders and other animal diseases, J. R. MOHLER (*Rpt. U. S. Live Stock Sanit. Assoc., 15 (1911), pp. 165–172*).—A discussion of the mallein reaction, complement fixation test, and the combined complement fixation and agglutination test, accompanied by a report of the results obtained in the various States. The combined test is the one recommended. See also a previous note (E. S. R., 27, p. 183).

Observations and investigations of infectious ostitis and osteomyelitis in the ox and horse, A. BAUMGARTNER (*Schweiz. Arch. Tierheilk., 53 (1911), No. 3, pp. 107–123, pls. 4, figs. 3*).—The author's observations and investigations have led to the following conclusions:

There is in the horse and bovine a very painful ostitis and osteomyelitis, caused by the necrosis bacterium alone or in symbiosis with a gram-positive coccus. It results in an uninterrupted motor disturbance of the most marked type, a skeletal lameness, an increased pulse rate, and often somewhat fever, but without affecting the appetite. In some cases abscess formation follows. The disease has a very destructive effect upon the bones without reactive osteophyte formation, therefore hypertrophy of the bone is never observed. The course is mostly slow and long continued. Iodin preparations have a

highly curative effect. Hitherto this disease has occasionally been classed with rheumatism.

The dissemination and action of the Pentastomum tænioides, S. von RÁTZ (*Allatorvosi Lapok, 34 (1911), No. 41, pp. 485–488; abs. in Berlin. Tierärztl. Wchnschr., 28 (1912), No. 8, p. 141; Vet. Rec., 24 (1912), No. 1236, pp. 582, 583*).—The adult of *P. tænioides* lives in the nasal cavities of the dog, wolf, and fox, and is also found in the same position in herbivora. "The larvæ occur in the thoracic and abdominal viscera, for the most part in the liver, lungs, and mesenteric lymphatic glands, and are often found free in the pleural and peritoneal cavities of the hare, guinea pig, goat, sheep, horse, ox, pig, deer, cat, etc., in addition to those of man. . . . The ripe ova pass out from the host's nose on to plants, and with them into the stomach of (usually) herbivora. Here the embryos, and later the larvæ, penetrate the intestinal wall into the blood and lymph vessels, and pass in these to the different organs, where the larva (formerly known as *L. serrata* or *P. denticulatum*) develops further. Afterwards it becomes encysted or wanders farther into the serous cavities. The author's results do not support the view formerly held of the active wanderings of the Linguatulæ in the bronchi.

"Infection in carnivora occurs as follows: Carnivorous animals take up the larvæ of the parasite with the lungs, liver, etc., which they devour. The larvæ wander from the stomach through the esophagus into the mouth, and thence into the nasal cavity. Moreover, when infected food is swallowed, single free larvæ may adhere to the palate and from there migrate into the nasal cavity. Finally, the author has experimentally proved that animals may acquire young Linguatulæ in their nostrils by smelling at organs containing larvæ.

"When in the nasal cavities the parasite causes bleeding. More rarely it occasions violent inflammation and nervous symptoms resembling those of rabies."

The diagnosis of rabies, J. REICHEL (*Ann. Rpt. Penn. Dept. Agr., 16 (1910), pp. 179–195*).—The usual history, symptoms, gross appearance after death, laboratory examination, animal inoculation test, microscopic examination, and rules regulating the examination and diagnosis are considered.

Investigations of and tick eradication in Rocky Mountain spotted fever, T. B. MCCLINTIC (*Pub. Health and Mar. Hosp. Serv. U. S., Pub. Health Rpts., 27 (1912), No. 20, pp. 732–760*).—The work of eradicating the Rocky Mountain spotted fever tick, conducted in cooperation with the State Board of Health of Montana, was begun May 26, 1911, an infected territory of about 8 square miles in the Bitter Root Valley, located about 3 miles from Victor, Mont., being selected for the work. A concrete dipping vat was constructed and 116 horses, 199 cattle, and 108 sheep were dipped and 155 redipped. Some 3,465 small wild animals, of which 3,233 were ground squirrels, were killed by shooting and trapping, and in addition many were killed by poison or carbon bisulphid.

"Out of a total of 4 badgers that were experimented with only 1 of them was found susceptible to infection with spotted fever, and of 5 guinea pigs that were inoculated with blood taken from this badger at 3 different times only 1 of them developed spotted fever. . . . The results with experiments of infecting 5 coyotes and 4 domestic cats were negative. . . . Only 2 weasels were experimented with, 1 of which was experimentally infected with spotted fever while the results obtained in the case of the other were negative but not conclusive." In a search made for the infection of spotted fever among ground squirrels in nature the results were negative.

"Rhesus monkeys and guinea pigs were infected with spotted fever and treated with different drug preparations, namely, Salvarsan, sodium cacodylate,

and urotropin. The results obtained, however, do not indicate that any of these drugs possess any value whatever either as a prophylactic or in the treatment of spotted fever, but on the contrary their administration seems on the whole rather to intensify the severity of the disease in the animals as compared with the course of the disease in the controls."

A bibliography of 76 titles is appended.

Agglutination, precipitation, and complement fixation as an aid for diagnosing trypanosome diseases, especially dourine (Beschälseuche), WINKLER and S. WYSCHELESSKY (*Berlin. Tierärztl. Wchnschr., 27 (1911), No. 51, pp. 933–936*).—The above mentioned reactions can be used for diagnosing these conditions.

[Transmission of Trypanosoma hippicum] (*Rpt. Dept. Sanit. Isthmian Canal Com., 1912, Feb., pp. 41–43*).—Experiments here reported "indicate very positively that *T. hippicum* can penetrate the mucosa of mules, which in the mouth and vagina is much thicker in proportion to the length of trypanosome than that of guinea pigs and rats used in other experiments, and it is assumed from this that murrina may be transmitted during copulation."

[Investigations of Trypanosoma hippicum] (*Rpt. Dept. Sanit. Isthmian Canal Com., 1912, May, pp. 41–43*).—"A strain of *T. hippicum* that had survived in a guinea pig the exceptionally long period of 336 days showed upon subinoculation on the two hundred and seventy-ninth and three hundred and thirty-sixth days very feeble pathogenic powers when compared with all other strains and with the same strain at an earlier period of the infection in the guinea pig."

Diagnosis, prevention, and treatment of tuberculosis, S. J. BONANSEA (*Diagnóstico, Prevención, y Curación de la Tuberculosis. Mexico, 1911, pp. 344, figs. 23*).—This is a general summary of the methods of diagnosing, preventing, and treating tuberculosis in animals. Mexican conditions are considered in particular.

The relation between human and animal tuberculosis, H. KOSSEL (*Deut. Med. Wchnschr., 38 (1912), No. 16, pp. 740–744*).—In an address before the Seventh International Tuberculosis Congress, held at Rome, the author maintains that the greatest source of infection for pulmonary tuberculosis in man is man himself, particularly because the human type of bacillus is almost always present. Very little tuberculosis has its origin from the consumption of milk and meat obtained from tuberculous animals. Therefore, when combating tuberculosis as a national disease it is necessary to direct efforts principally to human infection.

In regard to bovine and human tuberculosis, J. ORTH (*Sitzber. K. Preuss. Akad. Wiss., 1912, VII, pp. 155–179*).—A critical and historical discussion. Great stress is laid upon the point that tuberculosis in the human race can never be eliminated as long as the bovine type of the bacilli is conveyed from animal to man.

Differentiating the human type of tubercle bacillus from the bovine type by cutaneous injection of the guinea pig, E. TOMARKIN and S. PESCHIĆ (*Deut. Med. Wchnschr., 38 (1912), No. 22, pp. 1032–1034*).—More skin infections were obtained (through shaved but intact skin) with the bovine type of bacillus (26 out of 26 animals) than with the human type (7 out of 52 animals). The method can therefore be used for differential diagnosis.

The presence of tubercle bacilli in the circulating blood.—The elimination of tubercle bacilli in the milk of tuberculous women, T. KURASHIGE, R. MAYEYAMA, and G. YAMADA (*Ztschr. Tuberkulose, 18 (1912), No. 5, pp. 433–445*).—The elimination of tubercle bacilli in the milk of 20 tuberculous women, and in 2 cases which apparently were nontuberculous, was noted. The chief

source of the bacilli was the circulating blood. See also a previous note (E. S. R., 26, p. 281).

The specific antibodies in the blood serum of tuberculous subjects, B. MÖLLERS (*Deut. Med. Wchnschr., 38 (1912), No. 16, pp. 745, 746*).—The author maintains that for the early diagnosis of tuberculosis the serological tests thus far proposed can not be used in actual practice, and accordingly can not supplant the Koch subcutaneous reaction or the von Pirquet test.

Complement fixing bodies can be artificially produced in animals sensitive to tuberculosis just as they are produced in man by injecting large doses of tuberculin preparations. The best method of doing this, however, consists of injecting killed intact whole bacteria. The appearance of complement fixing bodies in the blood serum is an indication that a change is taking place in the humoral tissues, but whether this change has any significance as far as curing the disease is concerned must, according to the author, remain an open question. A positive prognostic significance can not be attributed to the complement fixing antibodies.

Examination of the feces of tubercular and nontubercular cattle, S. H. GILLILAND (*Ann. Rpt. Penn. Dept. Agr., 16 (1910), pp. 157–165*).—These experiments included tuberculin-reacting cattle with physical symptoms of tuberculosis, tuberculin-reacting cattle showing no physical symptoms of tuberculosis, and immunized cattle free of tuberculosis.

It was shown as a result of these tests that the microscopic examination of feces or rectal scrapings of cattle is of no value for detecting tubercle bacilli, because many bacteria are present in the feces which have the appearance and staining properties of the tubercle bacillus but which in the end do not prove themselves to be such. The animal inoculation test when applied in this direction is a valuable but not an infallible test. "Of the 40 cattle included in the examination, 9 (22.5 per cent) were found to be throwing off virulent tubercle bacilli in the feces or rectal scrapings. Of these 9 cattle, the tubercle bacilli were found virulent for guinea pigs, and in 8 of 9, the tubercle bacilli were virulent for rabbits."

Where the bacteria detected in the rectal scrapings, etc., have been proved to be tubercle bacilli, proof is presented that either an open tuberculosis exists or tubercle bacilli are passed through the length of the alimentary tract. "The demonstration of tubercle bacilli in the feces or rectal scrapings of cattle apparently free of tuberculosis, but stabled with highly infected cattle, may be accepted as an indication that tubercle bacilli are passing through such cattle, the tubercle bacilli being ingested and thrown off in numbers large enough to be demonstrable in the feces or rectal scrapings. . . . Tuberculin-reacting cattle do not necessarily throw off tubercle bacilli in the feces until the development of 'open' lesions of tuberculosis, in which event the condition may be detected by a consideration of the history, careful observation, and a complete physical examination."

See also a previous note (E. S. R., 27, p. 382).

Results obtained with the conjunctival reaction with tuberculin, as well as the local tuberculin reaction with bovines, A. WOLFF-EISNER (*Ztschr. Tiermed., 15 (1911), No. 1, pp. 1–49; abs. in Ztschr. Tuberkulose, 18 (1912), No. 5, pp. 494, 495*).—After a study of the reaction with a large number of bovines the conclusion is reached that it is more satisfactory than the subcutaneous test. An exact statement of the procedure as followed by the author is given. A 40 to 50 per cent solution of tuberculin (bovotuberculol and a dried tuberculin) was employed. Two or 3 instillations are given for the purpose of controlling the reaction.

Combating bovine tuberculosis according to the new epizootic laws in Germany, E. SCHARR (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 20, pp. 349–353*).—A discussion of the methods for diagnosing tuberculosis in bovines in Germany. Various phases of the law are critically discussed, including the reimbursing of the owner of tuberculous cattle.

Experience in eradicating tuberculosis from a herd, N. S. MAYO (*Rpt. U. S. Live Stock Sanit. Assoc., 15 (1911), pp. 186–191*).—This is a brief history of an outbreak of tuberculosis in the herd of the Virginia Polytechnic Institute, together with advice in regard to eradicating tuberculosis from herds.

Cultivation of the bacillus of chronic intestinal inflammation of the bovine (paratubercle bacillus), H. HOLTH (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 11 (1912), No. 5, pp. 378–387, figs. 6; abs. in Jour. Compar. Path. and Ther., 25 (1912), No. 2, pp. 148–150*).—In the author's investigation of Johne's disease cultures obtained from a case which reacted to avian tuberculin were planted upon 7 types of media. The most abundant growth was obtained on media consisting of blood serum with ¼ volume of liver broth, 2 per cent dead tubercle bacilli, and 4 per cent glycerin.

"At 6 weeks the whole surface of the medium was covered with colonies that were visible to the naked eye, and which later attained a size varying from ½ to 1 mm. By reflected light the colonies were greyish-white in color, and by transmitted light yellowish-brown. They were circular in outline, and under a low magnification the surface was observed to present a slightly wrinkled appearance. The colonies were tough. In older cultures there was observed the formation of a thin delicate membrane of wrinkled growth extending round the colonies. Growth on the other media presented similar appearances, but developed more slowly. Subcultures on the same medium yielded quite abundant growth in about 4 weeks."

The inoculation of guinea pigs failed to induce the disease, producing at most a small encapsuled abscess at the seat of inoculation, the contents of which contained a few granular acid-fast bacilli. Experiments with rabbits gave similar results. In experiments with tuberculin-tested calves, inoculations made subcutaneously and intravenously caused no reaction. Three months later the calves were tested with ordinary tuberculin and did not react but with avian tuberculin typical reactions were obtained at the end of 3 weeks.

"Experiments were carried out with guinea pigs with the object of ascertaining whether Johne's bacillus is capable of conferring any immunity against tuberculosis. The animals received 2 comparatively large doses of culture, and a month later a dose of bacilli of the bovine type. Control animals were inoculated with the bovine bacilli alone. All the animals were weighed twice weekly, and it was found that the control animals commenced to lose weight sooner than the others. The author concludes that a slight degree of immunity was established."

The anaplasmoses of cattle, L. E. W. BEVAN (*Vet. Jour., 68 (1912), No. 445 pp. 392–400*).—This is a general discussion of the subject. It is pointed out that while trypanblue is invaluable in checking piroplasmosis it is ineffective against anaplasmosis, which in the present state of our knowledge can be combated only by careful nursing and a diet which can be digested, assimilated, and made use of to replace and repair the loss of tissue caused by the disease.

Anaplasmosis of sheep, L. E. W. BEVAN (*Vet. Jour., 68 (1912), No. 445, pp. 400, 401*).—The author reports the occurrence of this disease among sheep. He states that it has a wide distribution throughout Rhodesia.

In regard to a vaccine prepared by a new method against hog cholera and swine plague, KRAFFT (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 15, pp. 261–266*).—The preparation of the vaccine is based on the following principle:

To warmed mixtures of highly virulent organisms certain metals are added for reducing the virulency of the micro-organisms, since micro-organisms so attenuated, when injected into animals, can be borne with impunity. Metallic salts in solution can not be used for this purpose on account of their toxicity. The vaccines prepared according to the above principle are employed by the author for immunizing purposes. The results of tests conducted with the vaccines prepared in this manner on mice, guinea pigs, rabbits, and shoats are reported, and showed good immunizing properties.

The vaccine for swine plague was prepared from *Bacillus suisepticus*, while that against hog cholera was produced with *B. suipestifer*. Some tests were also conducted, although very vaguely reported, with a vaccine prepared from *B. suipestifer* and the filtered blood from cases of hog cholera (also organ filtrates) which were exposed to the action of metals. The results of tests in veterinary practice showed that the latter preparation gave better results than those obtained with the *B. suipestifer* vaccine alone.

The diphtheria of suckling pigs, E. WYSSMANN (*Schweiz. Arch. Tierheilk., 52 (1910), No. 2, pp. 99–120; abs. in Berlin. Tierärztl. Wchnschr., 27 (1911), No. 33, pp. 596, 597*).—After describing the symptoms of this condition and the Guillebeau diphtheria bacillus which is usually present in the nasal and similar mucous membranes, the author states that this condition is either a special form of hog cholera where the diphtheria bacillus plays a secondary part, or a diphtheria proper.

RURAL ENGINEERING.

Private irrigation enterprise compared with government reclamation, F. G. TRACY ([*Denver, 1912*], *pp. 31*).—The author presents the opinion that the real meaning of the Reclamation Act has been misconstrued, and he attempts to show by tables of census data that private irrigation projects under the Carey Act have accomplished considerably more for less money than the Reclamation projects in the various States.

Irrigation and irrigating canals (*Rpt. Cal. Bd. Agr., 1911, pp. 205–223*).—This report briefly reviews the history of irrigation in California, discusses the reclamation works, dry farming, and private irrigation districts and systems, and describes the rivers, creeks, and lakes of the State, giving data of stream flow, drainage, and run-off in the different basins and drainage areas. Tabulated comparisons of irrigated farms and lands in different localities are also included.

Electric irrigation pumping in southern California (*Elect. World, 59 (1912), No. 23, pp. 1255–1259, figs. 8*).—A description is given of the use of electric pumps in the Pomona district.

About 125 electrically-driven irrigation pumping plants are operating within a radius of 10 miles, practically all the energy being supplied by a substation in the city of Pomona, connected with the general transmission of a power company by two 3-phase, 33,000 volt lines, the potential being reduced from 33,000 to 10,000 volts for local distribution among the ranches. The plants are designed for both deep-well and low-lift service, depending on local conditions, using 4 to 5 in. centrifugal pumps for the shorter lifts and double-acting cylinder pumps for the deep-well service. The cost varies from 2 to 3 cts. per kilowatt hour.

[Drainage problems in West Tennessee], L. L. HIDINGER and A. E. MORGAN (*Resources Tenn., 2 (1912), No. 6, pp. 231–249, pls. 2, figs. 2*).—A report on the drainage problems of the Wolf, Hatchie, and the South Fork of the Forked Deer rivers in West Tennessee, which drain approximately 4,815 square miles,

including plans of improvements, maps of surveys, descriptions of stream basins and adjacent drained territory, discussions of methods of reclamation by surface drainage with levees and by ditches, and plans for conveying ditch water under stream beds, levees, and main drainage channels by means of inverted siphons and concrete culverts.

The information indicates that channels should be large enough to carry a run-off of 1 in. in depth from the entire area drained by the river for large areas and somewhat larger for small areas where an excavated channel is economical. Where the volume of water is so great as to make undersurface channels too expensive, levees should be constructed sufficient to provide for a run-off of from 1½ to 2 in. per 24 hours from the entire watershed. The cost of the works approximates from $25 to $30 per acre.

[A tile drainage project] (*Brick and Clay Rec., 40 (1912), No. 11, pp. 479–482, figs. 11*).—A discussion of the planning and construction of a tile drainage system, reclaiming 500 acres of land on the Desplaines River in Illinois, in which work 250 carloads of tile and 2 years' time were consumed, and 65.3 miles of tile drains constructed. The cost of draining was approximately $75 per acre.

Practical road building, J. N. Edy (*Municipal Engin., 42 (1912), Nos. 4, pp. 215, 216; 5, pp. 351–354, fig. 1; 6, pp. 436–439, fig. 1*).—Brief specifications are given for the construction of sand-clay roads on a sand or clay subsurface and for the construction of gravel and macadam roads. Directions for the maintenance of these roads are also presented.

Road building with convict labor, D. Glass (*Country Gent., 77 (1912), No. 16, pp. 3, 30, fig. 1*).—The successful and economical use of convict labor for road building in Georgia is noted, the cost being found to be much cheaper than that of other labor. Chert roads have been built at a cost of from $4,000 to $5,000 per mile, while a sand and clay road costs from $400 to $500 per mile.

First report of the proceedings of the road board for the period from May 13, 1910 to June 30, 1911 (*Rpt. Proc. Road Bd. [Gt. Brit.], 1 (1910–11), pp. 69*).—A report on the existing physical and financial conditions of roads in the United Kingdom.

A new English tar tester (*Good Roads, n. ser., 3 (1912), No. 22, p. 337, fig. 1*).—A device is described which is intended to furnish a quick and easy method of testing bituminous materials to be used in road repair and construction. The instrument consists of a 9-in. stem carrying a weight, bulb, and 2 rings marking the beginning and end of the test. The test is based on the speed with which the instrument sinks in the liquid under examination.

Concrete costs, F. W. Taylor and S. E. Thompson (*New York and London, 1912, pp. XXII+709, pl. 1, figs. 76*).—This book gives tables and recommendations for estimating the time and cost of labor operations in concrete construction and for introducing economical methods of management.

Farm blacksmithing, G. Baxter (*Jour. Dept. Agr. Victoria, 9 (1911), Nos. 7, pp. 479–482; 8, pp. 545–549; 9, pp. 610–615; 10, pp. 685–689; 11, pp. 739–743; 12, pp. 795–799; 10 (1912), Nos. 1, pp. 49–54; 2, pp. 123–127; 3, pp. 192–195; 4, pp. 217–221, figs. 59*).—It is the object of this article to instruct the farmer how to lay out a blacksmith shop and make simple and useful articles connected with farm work and farm machinery. The required tools are enumerated and the processes of forging, welding, etc., are discussed in detail.

[Experience with farm powers], R. E. Gunn (*Farm and Dairy [Ontario], 31 (1912), No. 23, pp. 609, 617, fig. 1*).—The author relates his experience with the use of gasoline, steam, wind, and electric power on his farm, and states that electric power has supplanted all others.

How horsepower is to be computed (*Farm Machinery, 1912, No. 1077, pp. 15, 17*).—A general discussion of the methods of computing the power and efficiency of machinery with special reference to agricultural tractors, explaining the actual difference between indicated and brake horsepower, and stating as the factors to be considered in a comparison of the tractive horsepower of engines, the mean effective pressure, piston area and speed, dead weight of engine, and ground surface.

What electricity will do for the farmer (*Conn. Farmer, 42 (1912), No. 21, p. 9*).—Results of tests made on farms by a corps of engineers from an electrical appliance company are given, showing the different amounts of work done in a given time by different farm machines driven by electricity and the cost of the operation in each case.

An experience with electric motors, D. R. PALMQUIST (*Country Gent., 77 (1912), No. 23, p. 5, figs. 2*).—Some actual cost figures for the work done by a 15-horsepower portable motor on an average farm are given and compared with the costs of doing the work by other methods. The motor cost $260 and the power was supplied at 3 cts. per kilowatt hour. Some of the comparisons are as follows: 1,700 bu. of grain were threshed for $6.60, the cost of doing this by steam or gas tractor being $9; 4,000 bu. of corn were ground for $160, the cost at the nearest mill being $308; and fodder shredding cost $2.74 per ton, a neighborhood custom machine charging $3 per ton.

Electric farm lighting plant installation, G. D. HARRIS (*Gas Engine, 14 (1912), No. 6, pp. 332–335, figs. 2*).—A brief discussion of the practicability of small lighting plants, their successful operation, and the size, equipment, and cost of a plant most applicable to the average farm.

[Tests of implements], G. FISCHER ET AL. (*Arb. Deut. Landw. Gesell., 1911, No. 199, pp. 80, figs. 63*).—Descriptions and the methods and results of competitive tests are given of subsoil plows and pond-weeding machinery, with the results of preliminary examinations of several improved agricultural implements, among which are improved manure spreaders, rollers, straw presses, potato diggers, turnip headers, cultivators, mowers, and stump pullers, and the results of individual tests of subsoil packers, motor threshers, manure spreaders, and road tractors.

A new driving wheel for power plowing outfits, A. M. LEONI (*Gas Engine, 14 (1912), No. 6, pp. 316–318, figs. 3*).—A driving wheel is described which is equipped with a number of spades, and operated by an eccentric in such a way that with the rotation of the wheel they are pushed into the soil vertically, one after another, providing fixed points of power application for the forward movement of the vehicle and causing a minimum loss of energy.

Automobile mowing machines and motor-driven mowers, M. RINGELMANN (*Jour. Agr. Prat., n. ser., 23 (1912), No. 19, pp. 592–594*).—These 2 types of machine and their operation are described. It is claimed that with the automobile mower about 4,000 square meters (about 1 acre) of hay or other forage can be mowed in an hour. The motor-driven mowing machine requires 1 man and only 1 horse to do the work of an ordinary 2-horse machine.

Trials with small self-cleaning threshing machines, 1911, C. V. BIRK and C. L. FEILBERG (*Tidsskr. Landökonomi, 1912, No. 3, pp. 161–224, figs. 11*).—Eighteen different machines were examined and tested by the committee on machinery trials of the Royal Danish Agricultural Society. The report gives the results of the trials and the judgment of the committee as to the strong and weak points of the different machines.

Spraying apparatus, H. A. SURFACE (*Bi-Mo. Zool. Bul. Penn. Dept. Agr., 2 (1912), No. 2, pp. 68–77, pls. 5*).—A general discussion is given of apparatus for spraying orchards and field crops, including descriptions of various types

of hand and power sprayers. Considerable information is presented relative to the selection of spraying apparatus to satisfy special conditions.

[An automatic watering device] (*Deut. Landw. Presse, 39 (1912), No. 39, p. 463, figs. 2*).—A device for watering stock is described which is operated by the weight of the animal pressing down the approach board. This action is transmitted to a pump, thereby supplying fresh water for each animal.

Preliminary tests of new milking apparatus, B. MARTINY (*Arb. Deut. Landw. Gesell., 1912, No. 211, pp. 107, figs. 11*).—A report of the methods and results of tests of 3 milking machines, giving a description of each machine and a general discussion of test results.

[A cream separator] (*Indus. Latt. e Zootec., 10 (1912), No. 10, pp. 153, 154, figs. 3*).—A description is given of a separator which can be operated by hand or motor, with the results of 10 tests.

[Report of competitive tests of refrigerating and cold storage apparatus], B. MARTINY (*Arb. Deut. Landw. Gesell., 1912, No. 210, pp. 24, pls. 3, figs. 10*).—Descriptions are given of the construction and operation of refrigerating and cold storage apparatus designed more especially for dairy use, with the methods and results of competitive efficiency tests. The machines included self-acting refrigerators, hand and motor-driven coolers, and refrigerating and cold storage apparatus operating on a large scale. Some of the test results are graphically presented.

A small dairy house (*Farmers' Rev., 44 (1912), No. 20, pp. 537, 541, fig. 1*).—The essential factors to be considered in dairy house construction are pointed out, especially the need of drainage, cleanliness, ventilation, and sunlight, and the construction and equipment of a small dairy house recommended by this Department are described.

The silo for Missouri farmers, C. H. ECKLES (*Missouri Sta. Bul. 103, pp. 293–305, figs. 4*).—This is a bulletin of information for the Missouri silo user or prospective builder. Tables stating the tonnage capacity of silos of various sizes, and the proper capacity to build for herds of given sizes are followed by descriptions of different silo types; suggestions on crops for the silo; directions for cutting, filling, and feeding; and a brief list of bulletins on silos and silage.

RURAL ECONOMICS.

The organization of country life, W. M. HAYS (*Farmers' Nat. Cong. U. S., Proc., 31 (1911), pp. 139–146*).—An address delivered at the Farmers' National Congress, Columbus, Ohio, October 12, 1911, in which the author discusses at length some phases of eugenics as applied to agriculture and the rural population of this country. He suggests the organization of country life interests into a great delegate body, representing all the departments, institutions, and associations of national and state scope which are devoted to the upbuilding of country life, and this organization in turn to be federated with the Federation of Women's Clubs, the Federation of Labor, the National Manufacturers' Association, the Association of Railways, and other large organizations. Such a general federation he thinks could work out in a large way many things which would make for the prosperity and happiness of the whole people.

What is farm management? How does it help the practical man to solve his problems? W. J. SPILLMAN (*Tribune Farmer [N. Y.], 11 (1912), No. 551, pp. 3, 17, fig. 1*).—This article presents a discussion of what constitutes farm management, and the scope of its application. The author refers to it as "an old practice, but a new science—choosing the best type, organizing, and equipping the farm to the best advantage, and operation to secure the best utilization and distribution of equipment and labor are prime essentials."

Agricultural credit and its reorganization, TROSIEN (*Der Landwirtschaftliche Kredit und Seine Durchgreifende Verbesserung. Berlin, 1911, pp. VII+84*).—The results of an economic study of agricultural credit and its reorganization in Germany are presented and discussed. It is pointed out that the increase in running expenses in agriculture has exceeded the increase in the amount of money available for loans on land, thereby making more necessary the freeing of agriculture from debt. The privileges of mortgage holding are discussed and the necessity of their removal to the advantage of agricultural personal credit is explained.

Adaptation of the European credit system to meet the needs of the American farmer, D. LUBIN (*U. S. Senate, 62. Cong., 2. Sess., Doc. 855, 1912, pp. 14*).—This document presents a report made to the International Institute of Agriculture on the conference held at Nashville, Tenn., April 1–6, 1912, looking to the appointing of a select committee from the various States in the Union to go to Europe and investigate rural cooperative credit systems in operation there with a view to adapting them to the needs of American agriculture.

A number of suggestions are offered as a solution of the rural finance problem in the United States, among them the establishment of a system of agricultural national banks.

"One plan would be for the incorporation or cooperative association of groups of farmers, when they could devise and offer as security for the money they require a negotiable bond on their collective assets, a bond at a valuation and of a character which should make it acceptable in the world of commerce and in so liquid a form as to require no lawsuit for foreclosure. This bond could then be offered in the open market, and the funds for the cooperative banking be thus obtained. These funds could then be employed, first, for the use of the individual members of the cooperation, and, second, for the collective use of the cooperation as a whole in swinging its product to market; in its distribution."

A modification of this plan might be had by the formation of rural national banks, on the order of the existing national banks. "Let the cooperative groups of farmers call on government bond owners to transfer their bonds to these farmers' groups. Let the farmers pay the bond owners, say 1 per cent per annum for the privilege of this transfer. Let them deposit these transferred government bonds, along with their own negotiable land bonds, in the United States Treasury, where they would be held in trust for both parties by the United States. On the security of these government bonds the United States could issue national rural bank notes to these cooperative groups of farmers, just as it does in the case of national banks. The United States bond owner would then receive interest on his coupons, plus the 1 per cent per annum extra from the farmers' cooperative groups. These groups would thus have money at 1 per cent per annum, and the government bond owner would have as security a negotiable bond on the collective property of the farmers' cooperation, security which would exceed in value the United States bond deposited in the Treasury. In substance, the negotiable bond for this property and the government bonds would both be held in trust by the United States Government, which would simply act as umpire between the bond owners and the farmers, and thus this transaction would be free from any phase of so-called socialism."

A cooperative sugar factory in Holland, J. W. ROBERTSON-SCOTT (*Jour. Bd. Agr. [London], 18 (1912), No. 12, pp. 1014–1017, pl. 1*).—This article notes what is being done in the way of cooperative manufacture of sugar by farmers in Holland. One of the first factories established was in 1909 with 3,000 shares and

300 members, each paying £8 4s. per share. The figures in the following table show results of its working since beginning operation:

Work of cooperative sugar factory at Dinteloord, 1909–1912.

Years.	Number of members.	Number of shares.	Beets handled per season.	Beets handled daily.	Price paid per ton.
			Tons.	*Tons.*	
1909–10	644	3,150	65,000	1,038	21s. 8d.
1910–11	704	3,368	87,000	1,233	25s. 1d.
1911–12	720	3,430	119,000	1,400	28s. 4d.

"From the farmers' point of view, the cooperative factory is no doubt the ideal way of going to work." In this way the farmer gets his profits as beet grower and his dividend as a sugar manufacturer, it being stated that for the season 1911–12, "the members will be paid about 8s. 4d. more per ton for their beets than they would have got . . . from the joint stock companies."

[Compulsory insurance against sickness and unemployment] (*Internat. Inst. Agr. [Rome], Bul. Bur. Econ. and Soc. Intel., 3 (1912), No. 4, pp. 103–119*).—This article presents a discussion of the national insurance act of Great Britain and Ireland, which provides for the compulsory insurance of practically all persons employed in the United Kingdom under any contract of service or apprenticeship. The fund from which the insured are paid is raised by contributions from the State, employers, and the insured persons. The compensation for men is 7d. per week, for women 6d. "Where the rate of remuneration exceeds 1s. 5d. but does not exceed 2s. a working day, the State will pay 1d. per week, the employed contributor 1d. per week, and the employer 5d. for men and 4d. for women." Other data pertaining to the provisions and enforcement of the act are given, also a lengthy bibliography.

Influence of the agricultural associations and corporations on the organization of the German labor market (*Internat. Inst. Agr. [Rome], Bul. Bur. Econ. and Soc. Intel., 3 (1912), No. 3, pp. 36–47*).—The progress in industrial centers, depopulation of rural districts, new methods applied in farming, and unwillingness of agricultural laborers to contract for long periods have greatly increased the demand of German farmers for foreign labor, especially for the sowing and harvesting periods. Private labor bureaus being inadequate to supply this demand, several unions and corporations have endeavored to centralize the organization of the agricultural labor market, under the Central German Agricultural Labor Bureau.

The government has recognized this bureau and bestowed upon it certain special powers with regard to the registration of foreign laborers, and in reorganizing the agricultural labor market. In 1909, the bureau procured 70,397 foreign laborers, 76,001 in 1910, and 78,296 in 1911. It legitimized, that is, authorized to remain in the German Empire, 374,751 agricultural laborers in 1910, and 387,902 in 1911. "It has begun to exert a very useful action as arbiter between foreign laborers and German masters for the benefit and to the advantage of both parties." In 1909, 280 workmen and 212 masters appealed to it to settle their differences; in 1910 there were, respectively, 523 and 220 cases, and only 47 could not be amicably adjusted.

Other data as to the work of the bureau are given.

Increasing the efficiency of farm labor, W. M. Kelly (*Mich. Farmer, 138 (1912), No. 22, p. 613, fig. 1*).—Observations are made showing that in order to secure the greatest possible efficiency of farm labor the work must be

planned in such a way as to keep the laborers busy every day. Some suggestions are made regarding selection of crops and crop rotations and the selection of live stock and farm machinery with this end in view.

Agricultural population and its growth, A. C. Lecoco (*Rev. Agron. [Portugal], 9 (1911), No. 1–6, pp. 14–44*).—Notes and tables are given showing the movement of the agricultural population for a number of years in Portugal. It is noted that the rural population was 71.5 per cent of the total population in 1864, and 67.1 per cent in 1900. In 1890 the agricultural population was 3,088,610, and in 1900, 3,367,199, an increase of 9 per cent; while the non-agricultural population was 1,961,119 in 1890, and 2,055,933 in 1900, an increase of 4.8 per cent.

Abstract of statistics of the number and distribution of inhabitants (*Bur. of the Census [U. S.] Bul. 13, pp. 55, figs. 6*).—This bulletin presents in condensed form the principal results of the population census of 1910, including among other data tables and maps showing by divisions and States the urban and rural population in 1910, 1900, and 1890, and the increase in population during the same period.

[Agricultural and pastoral statistics for 1910 in Queensland], T. Weedon (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1910–11, pp. 115–172*).—Despite favorable climatic conditions for a number of years, only a small increase of cattle and sheep in Queensland is reported, this being attributed largely to the greater demand for dressed meat and meat products. Owing to governmental supervision of dairy products much recent progress is noted in dairying, the number of dairy cattle having increased from 304,281 in 1908 to 365,444 in 1910, and the quantity of butter from 17,538,473 lbs. in 1904 to 31,258,333 lbs. in 1910.

A continuous decrease in the excess of exports over imports of agricultural products from 1906 to 1910 is noted. Tables showing acreage, yield, total production, value, etc., of all crops are given. The estimated value of crops for 1910 was £3,863,707, an increase of £378,291, the principal items being sugar cane, £1,262,213; corn, £669,046; green forage, £448,335; fruits, £363,018; alfalfa hay, £322,359; wheat, £204,475; and potatoes, £132,872. A tendency is noted on the part of farmers to bring an increasing area of their holdings under cultivation, the average size of cultivated farms being 36 acres in 1908 and 40 acres in 1910.

Rural economy in the Bombay Dekkan, G. F. Keatinge (*Agr. Jour. India, 6 (1911), Nos. 3, pp. 208–220; 4, pp. 344–352*).—This article discusses the general conditions under which live stock is bred and reared in Dekkan, showing that in 1910 the number of horses and ponies totaled 71,000; sheep, 1,300,000; goats, 1,200,000; buffaloes, 500,000; and cattle, 2,900,000. Of the total number of cattle, 1,315,000 are used as plow cattle, cultivating about 13,635,000 acres, horses being of little importance. The supply of work cattle is said to be 31 per cent short of the demand, due possibly to the lack of attention given toward increasing the number or improving the quality. In many localities the cows and young stock are not fed but turned out all the year to feed upon the public grazing lands, and as these are practically barren wastes from March to July, the losses are very large.

The economic significance of farm machinery in connection with the land, the farmer, and the resources of the country is discussed, also the importance of circulating and reserve capital (E. S. R., 25, p. 595).

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 14 (1912), No. 6, pp. 41–48, fig. 1*).—Notes and statistics showing cotton condition May 25, and other crop conditions June 1, 1912, with comparisons; farm value of important products on dates indicated; foreign crop conditions; monthly receipts and stocks of eggs and poultry in the United States; range of prices of agri-

cultural products at important markets; temperature and precipitation statistics; the production of fruit and nuts in continental United States; and the causes and extent of crop damage in 1912 by States are here presented.

History of the Minnesota State Agricultural Society from its organization in 1854 to the annual meeting of 1910, D. S. HALL and R. I. HOLCOMBE (*St. Paul, Minn., 1910, pp. 405+XXIII, figs. 140*).

AGRICULTURAL EDUCATION.

The interrelationship of agricultural colleges and experiment stations, B. YOUNGBLOOD (*College Station, Tex., 1912, pp. 15*).—This paper, presented at the Conference for the Advancement of Agriculture of the Agricultural and Mechanical College at College Station, Tex., on April 29, 1912, comments briefly "upon the history and development of the agricultural colleges of this country with a view to understanding the scope and functions of their various divisions" as a working basis upon which to develop satisfactory relationships within these institutions.

Agricultural education in secondary schools (*U. S. Bur. Ed. Bul., 1912, No. 6, pp. 53*).—This bulletin is made up of the following papers read and discussed at the annual meeting of the American Association for the Advancement of Agricultural Teaching, Columbus, Ohio, November 14, 1911: Essentials in a State System of Agricultural Education, by F. W. Howe; The Need for Reliable Scientific Data Regarding Social and Economic Conditions in the Rural Communities, by E. C. Higbie; The Proper Equipment of an Agricultural High School, by D. O. Barto and D. J. Crosby; The Smith's Agricultural School and Agricultural Education in Massachusetts, by R. W. Stimson; The Unprepared Teacher of Agriculture in High Schools and Colleges, by A. V. Storm; and What is Being Done to Prepare Teachers of Secondary School Agriculture, by A. C. Monahan. A list of other recent publications of the Bureau of Education on agricultural education is also given.

The proper equipment of an agricultural high school, D. O. BARTO and D. J. CROSBY (*U. S. Bur. Ed. Bul., 1912, No. 6, pp. 20–27*).—For the proper study of soils suitable provisions for collecting, drying, and determining their essential constituents are necessary. A laboratory should be well stocked with carefully selected, prepared, and labelled specimens of farm crops, weeds, seeds, etc. Samples of various commercial fertilizers on the market should be kept labelled to show their chemical composition. There should be a glass house properly heated, where plants may be grown and studied during the winter. Too much land should be avoided as small plats worked with care and accuracy are deemed of much more educational value than larger areas where part of the work is done by some one not connected with the school. Arrangements should be provided for pruning, budding, grafting, spraying, etc. A milk tester, separator, and churn should be provided for instruction in dairying, and the classes should visit the farms of the vicinity to study typical animals, birds, flocks, and up-to-date equipment.

The unprepared teacher of agriculture in high schools and colleges of education, A. V. STORM (*U. S. Bur. Ed. Bul., 1912, No. 6, pp. 33–40*).—The author believes that the standard of preparation for a teacher of agriculture should contain the same elements whether he is to teach agriculture in a country school, high school, normal school, or college, and would differ only in the proportionate amount of each and the special adaptation to the particular kind of school. The proper preparation for one who is to teach agriculture in a high school would be, besides moral and natural fitness, a general education consisting of actual experience on the farm, elementary training in reading, arith-

metic, language, spelling, geography, etc., and a strong high school course of 4 years distributed about as follows: Mathematics, 2½ years; English, 3 years; history and civics, 2 years; science, 3½ years; foreign language, 2 years; and electives, 3 years. If the pupil is preparing to teach in the elementary schools his advanced work could be taken at a normal school, but if in schools above those of elementary grade his advanced training should be received at a college or university. His advanced preparation should be in 4 different lines: (1) General, which includes such subjects as English, public speaking, and economics; (2) technical, constituting botany, chemistry, zoology, physiography, physics, and agriculture as a specialty; (3) professional, comprising such subjects as psychology, history of education, principles of education, principles of general method and the method of the recitation, special methods of high school subjects, and school management; and (4) practice in teaching.

It is suggested that normal schools and agricultural colleges when recommending teachers for agricultural high schools should select their candidates in the following order: (1) Those with natural ability, farm experience, and agricultural preparation, even though they have had no professional preparation or teaching experience; (2) those with natural ability, agricultural preparation, professional preparation, and teaching experience; (3) those with natural ability, farm experience, good science preparation, and teaching experience; and (4) those with natural ability, farm experience, good science preparation, and no teaching experience.

High school agriculture subjects accepted for matriculation at the University of California (*Col. Agr. Univ. Cal. Spec. Circ., 1912, May, pp. 4*).—This is a full outline of courses in general agriculture, animal husbandry, dairying, horticulture, farm mechanics, and farm management which may be offered by high schools in the State for entrance credits at the college of agriculture of the University of California for a total of 9 units.

University Farm School, Davis, Cal. (*California Sta. Circ. 77, pp. 23, figs. 13*).—This circular contains an announcement of the 3-year course of study at the institution, and briefly describes the work of the school.

Seed testing, W. L. Oswald (*Univ. Minn., Dept. Agr., Ext. Bul. 24, 1911, pp. 8, figs. 12*).—Directions are given for home purity and germination seed tests.

Oklahoma school hotbeds, S. A. Minear (*Bul. Okla. Agr. and Mech. Col., 8, (1911), No. 14, pp. 7, figs. 5*).—This bulletin is intended to assist Oklahoma teachers in the construction and use of hotbeds in their schools.

Transplanting, V. H. Davis (*Agr. Col. Ext. Bul. [Ohio State Univ.], 7 (1912), No. 8, pp. 16, figs. 14*).—The author discusses transplanting operations, particularly the replacing of the lifted plant in the soil by the ultimate purchaser. Trees, shrubs, and herbaceous plants are considered separately. A homemade corn tester is described and illustrated.

A method of illustrating the trees, J. E. Kirkwood (*Nature-Study Rev., 8 (1912), No. 1, pp. 39–41, fig. 1*).—The author describes a set of botanical preparations, originally designed for the exhibit of the University of Montana at the state fair but since found of much practical value in school work. Each preparation illustrates one species and consists of a wall frame 26½ by 32½ in., containing a card on which is mounted under glass a full-sized herbarium specimen of the species, showing leaves and flowers, the fruit where practicable, a seedling, a map showing distribution, a section of the wood, several photographs of individual trees showing the character of the bark or other features, and landscape scenes depicting the habitat of the species. Some of this material may be contributed by the pupils as a part of their laboratory or field work.

A guide for the study of animals, W. WHITNEY ET AL. (*Boston, New York, and Chicago, 1911, pp. IX+197*).—This guide is intended for pupils in secondary schools, and gives particular attention to the chordates. Special prominence is given to the economic side of zoology, especially its bearing on medicine, sanitation, household science, and agriculture.

Oregon boys and girls and the egg problem, J. DRYDEN (*Oreg. Agr. Col. Bul., Ext. Ser. 2, 1912, No. 2, pp. 4*).—This bulletin gives instructions for boys and girls on feeding and housing fowls, with an estimate of the profits.

Ravenel's road primer for children, S. W. RAVENEL (*Chicago, 1912, pp. 159, pls. 21, figs. 34*).—This primer was compiled and prepared at the request of the National Congress of Mothers. It gives instruction and suggestions concerning elementary principles and practices of road making, causes and effect of good roads, their location, grades, drainage, maps and profiles, construction, and maintenance, narrow and wide tires, some kinds of roads, and machinery necessary for the use of road builders.

MISCELLANEOUS.

Biennial Report of Connecticut Storrs Station, 1910–11 (*Connecticut Storrs Sta. Rpt. 1910–11, pp. XL+601, pls. 10, figs. 216*).—This contains the organization list, a financial statement for the fiscal years ended June 30, 1910, and June 30, 1911, reports of the director and heads of departments, reprints of Bulletins 59–69, and a general weather review, abstracted on page 414 of this issue.

Nineteenth Annual Report of Minnesota Station, 1911 (*Minnesota Sta. Rpt. 1911, pp. XLIV+188+XI, pl. 1, figs. 38*).—This contains the organization list, a list of the publications of the year, a financial statement for the fiscal year ended June 30, 1911, a report of the director summarizing the work of the station and its substations, and reprints of Bulletins 121–124, previously noted.

Twenty-second Annual Report of New Mexico Station, 1911 (*New Mexico Sta. Rpt. 1911, pp. 57, figs. 4*).—This contains the organization list, a report of the director briefly summarizing the work of the station since its establishment, lists of the changes in staff, publications, and exchanges of the year, departmental reports on the various lines of station activities during the year, and a financial statement for the fiscal year ended June 30, 1911. The report of the meteorologist and a portion of that of the horticulturist are abstracted elsewhere in this issue.

Finances, meteorology, index (*Maine Sta. Bul. 197, pp. 329–340+XII*).—This contains the organization list of the station; meteorological observations noted on page 414 of this issue; a financial statement for the fiscal year ended June 30, 1911; an index to Bulletins 187–197, which collectively constitute the twenty-seventh annual report of the station; a list of the publications issued during the year; and announcements and notes on the work, personnel, and equipment of the station.

Report of work at the Delta Branch Experiment Station for 1911, G. B. WALKER (*Mississippi Sta. Bul. 157, pp. 23, figs. 5*).—This contains a report of the work at this substation during 1911, including in addition to the data on field crops, abstracted on page 429 of this issue, brief notes on the work with cattle, mules, and hogs.

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Georgia College and Station.—Recent appointments in the college include Charles A. Whittle as editor-librarian, C. M. Kiger as tutor in horticulture, G. E. Rice as a district corn club agent vice G. M. Gay, and H. B. Carpenter as instructor in animal husbandry.

The station live stock and hay barn was struck by lightning on the evening of September 4, causing a loss of the barn, about 15 tons of hay, and several adjoining structures. The loss was covered in part by insurance.

Massachusetts College and Station.—Recent appointments in the college include the following: W. D. Clark, of the Pennsylvania College and Station, as professor of forestry; O. A. Morton as extension professor of agricultural education; A. A. Brown as instructor in poultry husbandry; W. W. Chenoweth as instructor in pomology; Samuel Coons as instructor in dairying; E. M. McDonald as instructor in agronomy; Arthur T. Dailey as supervisor of extension courses; and E. L. Morgan as community field agent. F. W. Morse has been designated acting director of the station, beginning October 1.

Nebraska University and Station.—R. K. Bliss, of the Iowa College, has been appointed professor of animal husbandry and animal husbandman; W. J. Morrill professor of forestry and forester; and G. C. White, of the Missouri University and Station, adjunct professor of dairy husbandry, vice W. L. French, resigned.

New Hampshire College.—Dr. Edward T. Fairchild, superintendent of public instruction in Kansas, has been appointed president.

Cornell University and Station.—John Craig, professor of horticulture since 1903, died August 12 at Siasconset, Mass. Professor Craig was born at Lakefield, Quebec, in 1864, and educated at McGill College and the Iowa College, graduating from the latter institution in 1887. For about 12 years he served as horticulturist at the Central Experimental Farm at Ottawa, Canada, returning to Iowa in 1899 to become professor of horticulture. In 1900 he was appointed professor of extension teaching in Cornell, relinquishing this position three years later to accept the chair of horticulture.

Professor Craig was the author of a revised edition of Practical Agriculture and a contributor to the Cyclopedia of American Horticulture, as well as the author of numerous station publications and articles in agricultural journals. He had been editor of the *National Nurseryman* for several years, and at the time of his death was secretary of the American Pomological Society.

He was especially well known in the field of pomology, having a wide acquaintance and being in much demand as a judge at exhibitions. He was also much interested in nut culture, chairman of the nomenclature committee of the American Sweet Pea and American Peony Societies, and a fellow of the Royal Horticultural Society of Great Britain.

Ohio Station.—A. F. D. Wussow has been appointed assistant in the department of nutrition; J. S. Houser has been promoted to the position of associate entomologist.

Porto Rico University.—The college of agriculture and mechanic arts opened its new building to students September 23. The initial enrollment of the year was 172, of whom 22 are in the agricultural courses.

Rhode Island Station.—Director H. J. Wheeler has tendered his resignation to take effect December 1.

Utah College and Station.—The extension work has been reorganized with Dr. E. G. Peterson as director and John T. Caine, III, as assistant director in charge of field parties. Robert J. Evans, Ph. D. (Cornell, 1912), has been appointed agronomist in the station in charge of arid farms and will also assist in the extension work. Dr. J. E. Greaves, associate chemist, has taken over Dr. Peterson's work in bacteriology as professor of bacteriology and bacteriologist, and H. E. McNatt has been appointed assistant animal husbandman in the college and station to succeed Professor Caine. G. M. Turpin resigned October 1 as poultryman to accept a similar position in the Iowa College.

Vermont College.—A. K. Peiterson has been appointed instructor in botany in the college of agriculture, vice John P. Helyar, whose resignation has been previously noted; and R. T. Burdick, a 1912 graduate of Cornell University, has been appointed instructor in agronomy.

Washington College and Station.—H. B. Humphrey has resigned as vice director of the station to accept the position of head of the department of botany in the college. Robert C. Ashby, superintendent of the farmers' institutes, has been appointed professor of animal husbandry in the college and animal husbandman in the station. Dr. Ira D. Cardiff, of Washburn College, has been appointed professor of plant physiology and bacteriology in the college and plant physiologist in the station.

Recent Federal Agricultural Legislation.—Aside from the agricultural appropriation act, a summary of which has already been given (E. S. R., 27, p. 301), among the principal agricultural measures to be enacted at the recent session of Congress was the Plant Quarantine Act, approved August 20. Under this law nursery stock may now be imported only after a permit has been issued by the Secretary of Agriculture, when properly labeled, and when accompanied by a certificate of inspection from the country of export (or in case no official system of inspection is maintained in that country upon compliance with regulations prescribed by the Secretary). Notice of its arrival at a port of entry in this country must also be given to the Secretary, and its subsequent movements in interstate commerce or the District of Columbia reported until it has received inspection from the proper state official.

Similar regulations may also be promulgated as regards the importation of other plants, fruits, vegetables, seeds, etc., in case their unrestricted entry becomes prejudicial. Whenever deemed necessary in order to check the introduction of a new pest, importations may be excluded entirely from certain countries or of certain kinds of plants and their products, and any State may be quarantined as regards the shipment of affected products in interstate commerce. A foreign quarantine has already been put in force against the white pine blister rust and potato wart, and a domestic quarantine against Hawaiian products likely to carry the Mediterranean fruit fly.

The administration of the act is entrusted to a Federal Horticultural Board of this Department, consisting of C. L. Marlatt and A. F. Burgess of the Bureau of Entomology, W. A. Orton and Peter Bisset of the Bureau of Plant Industry, and G. B. Sudworth of the Forest Service. The act as a whole became effective October 1, and carries an appropriation of $25,000.

Another inspection measure, passed August 24 and effective February 24, 1913, prohibits the importation for seeding purposes of grain and grass seed

which are deemed adulterated or unfit for seeding purposes because of excessive weed content.

An act approved August 3 establishes a standard apple barrel containing 7,056 cubic inches, and defines standard grades for the fruit on the basis of variety, size, and quality. Labeling the barrels remains optional, but the use of the designation "standard" in case the fruit or barrels do not conform to the requirements is deemed misbranding, and if done knowingly renders the packer or seller liable to a penalty of $1 per barrel and costs. The act does not become effective until July 1, 1913.

Provision was made in the Post Office appropriation act for investigations by a joint committee of Congress of the practicability of federal aid in the construction of post roads, and also for cooperative work by the Secretary of Agriculture and the Postmaster General in road improvement with a view primarily to increasing the effectiveness of rural mail delivery. An appropriation of $25,000 was allotted for the Congressional investigation, and this Department was granted $500,000 for use in States or local communities contributing double the federal allotments.

Other legislation provides for the collection of additional cotton statistics, and an inquiry into the general conditions of farm and other labor. As an attempt to demonstrate the possibilities as to growing spineless cacti for forage, Luther Burbank was granted the use of not to exceed 12 sections of semiarid lands for 5 years with the privilege of purchasing these lands at from $1.25 to $2.50 per acre if successful. The Food and Drugs Act of 1906 was amended by extending its provisions to false and fraudulent claims on the package or label as to the curative or therapeutic action of drugs. The Public Health and Marine-Hospital Service was designated the United States Public Health Service, and its functions extended to include studies of the diseases of man, sanitation, and related questions.

Association of Official Agricultural Chemists.—The twenty-eighth annual convention of this association was held in Washington, D. C., September 16 to 18, with a registration of 184 members and visitors.

The president of the association, H. J. Patterson, delivered the annual address, which dealt primarily with the part played by the association in the formation of the present system of agricultural colleges, experiment stations, and the development of modern agriculture. Attention was drawn to the advanced position occupied by the agricultural chemist of to-day, as compared with his status years ago. Special emphasis was placed on the necessity of standardizing college degrees conferred in chemistry, and of the chemical investigator of the present day having a working knowledge of an allied science, such as bacteriology or plant pathology. In addition, it was pointed out that a cooperative spirit should prevail between the chemists in the laboratory, as this will have a tendency to develop initiative, stimulate research, and prevent the development of routine workers.

Assistant Secretary of Agriculture W. M. Hays presented the greetings of this Department. He pointed out the need that more scientific men, chemists and others, should be studying problems which relate to eugenics, and also advocated extension work in the sciences.

The referee and associate referee on phosphoric acid, H. D. Haskins and A. J. Patten, reported a thorough study of the official volumetric method for the determination of both the available and total phosphoric acid in basic slag phosphate and a further study of the citrate of ammonia magnesia-mixture method. In the determination of available phosphoric acid, using Wagner's method for making the citric solution of the slag, closely agreeing results were not obtained by the analysts. Of the various methods the optional volumetric method gave

the lowest results, and the gravimetric method (official) gave the highest results when sulphuric acid was used as a solvent. Further work is to be done on these methods, with the same kind of slag. The committee appointed at the last session to study the availability of the phosphoric acid in Thomas slag phosphate also rendered a preliminary outline of methods, accompanied by blueprints for field, pot, and cylinder experiments.

The referee on nitrogen, C. L. Hare, reported the results of further study of a method for organic nitrogen activity and on the Salle method for determining nitrogen in nitrates. Four out of 5 sets of results obtained with the neutral permanganate method for organic nitrogen activity were in close agreement, and showed fairly uniform results in the hands of different analysts, without reference to the material used. The results with the alkaline permanganate method were not so uniform, except with treated feathers and mixed fertilizers. The Salle method is deemed worthy of further consideration.

H. B. McDonnell, as referee on potash, reported the results of cooperative work, using kainit as the test material. The results obtained with the platinum method were very satisfactory. The cobalti-nitrite method was not considered reliable in its present form, and the results thus far obtained with the perchloric acid method were low. Changes in the method of making the solution were also tested, with practically the same results as in the official method.

The associate referee on the availability of potash, E. E. Vanatta, reported on several samples of fertilizers which were known to contain manure ashes, using the official and J. L. Smith methods. The solubility of potash from such sources seems to vary inversely with the degree of heat employed in the furnaces used for burning the manure, and if the furnaces are too hot an insoluble silicate of potash is in all probability produced. In the sample less than one-half of the total potash was soluble when the official method was used. The results of some analyses of twigs and leaves from the peach tree are also included. A proposed modification of the official method for availability of potash was adopted, likewise a suggestion for making pot or plat experiments with potash of known organic origin and with inorganic forms.

G. S. Fraps, the referee on soils, reported on acidity methods of extracting humus, and a comparison of the Rather with the official method. It was decided that these various methods be studied further.

As a result of cooperative work done with inorganic plant constituents the referee, W. H. McIntire, recommended that the associate referee, B. E. Curry, be instructed to pursue studies with the Schreiber method for sulphur during the coming year. Unsatisfactory results were obtained with the oxalate method for iron and aluminum, and it was recommended that further study of this method be discontinued. The molybdate method was adopted as official, and a further study is to be made of its extension to the determination of calcium as oxalate and magnesium as magnesium-ammonium phosphate.

Following the report of the referee on insecticides, S. D. Averitt, the chromate method for total lead oxid in lead arsenate was adopted as official. The provisional methods for the analysis of lead arsenate were changed in accordance with recommendation 7 of the referee in 1910 and adopted as official.

L. F. Kebler, chairman of the committee on the testing of chemical reagents, reported a decided improvement in quality in the chemical reagents obtained by the Bureau of Chemistry during recent years. Many chemists, however, are still too willing to accept chemical reagents as delivered without questioning their purity.

The committees on the unification of analytical methods, fats and oils, and food standards were discharged.

The referee on water, W. W. Skinner, reported the results of cooperative work, and recommended that the phenol sulphonic acid method for nitrites and the

reduction method for nitrogen as nitrates (optional) be adopted as official. The method for strontium and the colorimetric method for the determination of iodin and bromin are to be further studied.

A. S. Mitchell, associate referee on food adulteration, gave a résumé of the work conducted on food adulteration during the past year. W. E. Mathewson, associate referee on colors, recommended that the methods described for the qualitative separation of coloring matters be adopted provisionally and that work bearing on the separation and identification of these substances be continued.

A. H. Bryan reported on the proceedings of the Eighth International Commission for Uniform Methods of Sugar Analysis, held in New York September 10. The resolutions of the commission concerning the temperature of polarization and the use of a neutral bichromate of potash light filter cell were referred to the referee on sugar, W. E. Cross, for report at the next meeting. Following a recommendation from the associate referee on saccharin products, J. R. Chittick, the method for the determination of solids in molasses and other sugar products, by means of the refractometer, using Geerlig's table of equivalents and temperature corrections, but expressing the results as percentages calculated from the refractometer readings, was adopted as a provisional method.

The associate referees on vinegar and flavoring extracts, W. A. Bender and R. S. Hiltner, reported cooperative work in these subjects. A continuation of a study of the refractive index of the ether extract of paprika with particular regard for detecting added oils was reported by the associate referee on spices, R. W. Hilts. He recommended that a method be devised for detecting an excess of seeds in paprika and that samples of prepared mustard be studied as to their crude fiber content. E. Clark, as the associate referee on baking powders, reported considerable difficulty in getting arsenic-free reagents for determination of arsenic in baking powders.

The associate referee on meat and fish, W. B. Smith, reported on the study of starch, ammonia, and nitrate determinations. He recommended that the Price method for starch be substituted for the Mayerhofer method, and the Folin method for the magnesium oxid method for estimating ammonia.

H. C. Gore, associate referee on fruit products, reported results of studies on the determination of malic and citric acid. With the Pratt method for citric acid duplicates were hard to obtain, as tartaric acid when present in considerable amounts seems to interfere. In the malic acid cooperative work the results obtained agreed well. A study was also made of the optical rotation of malic and tartaric acids, respectively, in the presence of varying amounts of uranium acetate.

As to fats and oils, H. S. Bailey, associate referee, reported the results of a cooperative study of the glycerol method for the saponification of fats, and compared various procedures with the official method. The provisional method for the preparation of samples, the Zeiss butyro-refractometer method, method 12 for the determination of free fatty acids, the Halphen reaction for cotton-seed oil, the Baudouin test for sesame oil, and the Villavecchia test for sesame oil, all as given in Bulletin 107, revised, of the Bureau of Chemistry, were adopted as official.

The Emery method for the detection of added beet fat in lard, and the glycerin method for the preparation of fatty acids for use in the titer test, were made provisional, as was also the use of 75° as the temperature for use in the determination of the specific gravity of high melting-point fats.

A. E. Paul, as the associate referee on dairy products, reported a further study of his method for extracting fat from milk, cream, ice cream, evaporated milk, and sweetened condensed milk. The associate referee on cereal products,

H. L. White, reported cooperative work with methods for the estimation in wheat flour of soluble carbohydrates, gluten, gliadin, edestin and leucosin, amid nitrogen, nitrous nitrogen, moisture, and acidity of watery extract.

As regards condiments other than spices, W. J. McGee, associate referee, reported cooperative work done almost wholly with tomato catsup. He recommended a method for the determination of lactic acid and the adoption provisionally of methods for the analysis of tomato products. The cooperative work on cocoa products, as reported by the associate referee, W. L. Dubois, concerned the determination of fat in chocolate, and total solids, crude starch, and casein in milk chocolate. H. E. Barnard, associate referee on preservatives, reported that his work had been almost wholly devoted to the detection and estimation of formic acid, which he considered more important at present than the study of better known preservatives.

The report of H. C. Lythgoe, associate referee on water in foods, dealt with the results of a comparative study between the official and vacuum methods, using different dehydrating agents, of which phosphorus pentoxid seemed to be the most feasible. H. M. Loomis, associate referee on heavy metals in foods, reported on the determination of tin in foods, principally by the Doolittle and Lourie and the Schreiber and Tabor methods.

The referee on the separation of nitrogenous bodies (meat proteins), A. D. Emmett, reported that the Kjeldahl-Gunning-Arnold method gave equally good results as the Kjeldahl method for total meat proteins. Additional data on soluble, insoluble, and coagulable nitrogen, creatin, and creatinin in meats and meat extracts were included in the report. The associate referee on vegetable proteids, T. B. Osborne, pointed out that present knowledge of the quantitative methods available does not yet justify definite recommendations. In view of the recognized difficulties, extended investigations were advocated, and a brief outline of a plan presented for undertaking them. A committee was appointed to consider these recommendations.

The associate referee on dairy products, L. I. Nurenberg, dealt with tests for distinguishing between raw and pasteurized milk and some recently proposed reactions for detecting old milk, viz, Schardinger's, Rothenfusser's, benzidin, and alcoholic precipitation (coagulation) with a reagent containing alizarin for approximating acidity. Bacterial counts were made in conjunction with the tests. Recommendations were made that the formaldehyde-methylene blue reaction, the methylene blue reaction, and the 68-per cent alcohol precipitation method be further studied.

The referee, W. J. Jones, and associate referee, C. S. Cathcart, reported cooperative work on the analysis of feeding stuffs, which dealt mainly with methods for determining acidity and the petroleum-ether method for fat. In the study of acidity no close agreement among the results was obtained, and no apparent definite relation could be found between the acidity figures and the amount of protein. The petroleum-ether method for crude fat showed closer duplicates among the majority of analysts than the official method, but in all samples a lower average result. The official method is considered easier to conduct and to allow more perfect and rapid drying of the extract, but the petroleum-ether method more nearly gives the real amount of fat present, and was recommended for further study.

L. F. Kebler, the referee on medicinal plants and drugs, discussed methods of sampling and analysis, and the inadequate standards of the present time. Special stress was laid on securing proper samples and on the fact that sampling must be modified according to the nature of the goods to be tested. In drawing conclusions, all available means, such as physical, organoleptic, chemical, mechanical, and microscopical must be enlisted.

G. W. Hoover, associate referee on medicated soft drinks, reported satisfactory results in cooperative work in the determination of the constituents caffein, cocain, phosphoric acid, and total solids. W. O. Emery, associate referee on synthetic drug products, reported that in analyses of headache tablets a method had been devised for the estimation of caffein, acetanilid, quinin, and morphin in the same preparation. Aspirin was also studied in regard to melting point, either alone or in admixture with salicylic acid. Salol was estimated satisfactorily with a standardized bromin solution. A. G. Murray reported cooperative work on the estimation of nitroglycerin in medicinal tablets, and H. E. Buchbinder on similar work with the Eaton method for morphin.

At the suggestion of W. D. Bigelow, a committee was appointed to edit a new issue of the official methods of analysis. Resolutions were adopted in memory of the late Director M. A. Scovell, of the Kentucky Station, and Prof. H. A. Weber, of Ohio State University.

The papers read during the session were as follows: A Proposed Modification of the Official Method for Determining Humus, by O. C. Smith; Application of the Ammonium Carbonate Method for the Determination of Humus to Hawaiian Soils, J. B. Rather; Note on the Analysis and Valuation of Maple Sugar, A. H. Bryan; A Proposed Method for the Determination of Tartaric Acid in Wines and Grape Juice, B. G. Hartman; The Composition of Vanilla Extract From Tahiti and Fiji Beans, A. L. Winton and E. H. Berry; A Probable Method for the Estimation of Optically Active Oils in Extracts, C. F. Poe; A Method for the Detection of Caramel in Tincture and Extract of Ginger, R. S. Hiltner; The Chloral Hydrate Test for Charlock, A. L. Winton; Determination of Starch in Meat Products, E. M. Bailey; The Modified Babcock Test for Fat in Sweetened Dairy Products and Ice Cream, J. O. Halverson; Determination of Lead in Cream of Tartar and Baking Powders, Paul D. Potter; Determination of Nitrogen Activity by the Modification of the Neutral Permanganate Method, J. M. McCandless; A Study of the Lead Number of Asafœtida and Allied Products, E. C. Merrill; Estimation of Morphin, H. E. Buchbinder; Comparison of Values Obtained for Refractive Indices of Aqueous Solutions of Ethyl and Methyl Alcohol, B. H. St. John; and Determination of Camphor by the Hydroxylamin Method, E. K. Nelson.

The officers elected for the coming year were as follows: Honorary president, H. W. Wiley, Washington, D. C.; president, G. S. Fraps, College Station, Tex.; vice president, E. F. Ladd, Agricultural College, N. Dak.; secretary, W. D. Bigelow, Washington, D. C.; additional members of the executive committee, C. H. Jones, Burlington, Vt., and R. N. Brackett, Clemson College, S. C.

Agricultural Chemistry at the Eighth International Congress of Applied Chemistry.—This congress was held in Washington and New York, September 4 to 13, under the patronage of the President of the United States. The papers presented before the section of agricultural chemistry were as follows: Factors Influencing the Composition of the Blood of Steers, P. F. Trowbridge and L. D. Haigh; Changes in the Composition of the Dairy Cow During Fattening Period, P. F. Trowbridge; Mineral Constituents of the New Born Calf, A. G. Hogan; Composition of Beef Fat as Influenced by Age and Condition of the Animal and Location in the Body, L. E. Morgan; A Study of the Cost of Maintenance and Growth and the Changes in the Composition of the Mature Beef Animal During the Fattening Period, C. R. Moulton; A Study of the Variations in Chemical Composition of the Timothy and Wheat Plants During Growth and Ripening, L. D. Haigh; Some Factors Influencing the Quantitative Determination of Arsenic in Soils, J. E. Greaves; Organic Phosphorus of Soil, J. Stewart; Plasticity of Clay, J. Stewart; The Composition of the Loess Soils of the Transition Region, F. J. Alway; Experiments with Reinoculation of Steamed Soils,

T. L. Lyon and J. A. Bizzell; Conservation of Phosphorus in the Urine, P. E. Browning; The Effect of Sodium Manures on the Percentage of Sugar in Certain Plants, B. L. Hartwell and P. H. Wessels; A Study of Soil Potassium, B. E. Curry and T. O. Smith; Composition and Digestibility of the Ether Extract of Fodders, G. S. Fraps and J. B. Rather; The Composition and Digestibility of the Chloroform Extract of Plants, G. S. Fraps and J. B. Rather; Soil Potash and Phosphoric Acid and Their Relation to Pot and Field Experiments, G. S. Fraps; The Effect of Fertilizers on the Composition of the Asparagus Plant, F. W. Morse; Calcium Arsenite as an Insecticide, E. B. Holland and J. C. Reed; The Combustible Gases Excreted by Cattle, J. A. Fries; The Metabolism of Cattle When Standing and Lying, H. P. Armsby and J. A. Fries; Error in the Babcock Butter-Fat Test of Fresh Milk Caused by Improper Diameter of Test Bottle Necks, J. C. Manchester; Field Test With Fertilizers, H. A. Huston; The Manganese Present in the Normal Animal Body, G. Bertrand and F. Medigreceanu; Use of Manganese as a Catalytic Fertilizer, G. Bertrand; Use of Sulphate of Aluminum as a Catalytic Fertilizer, G. Bertrand and H. Agulhon; Use of Boron as a Catalytic Fertilizer, H. Agulhon; The Inheritance of a High Starch Content in Potato Tubers, P. de Vilmorin and F. Levallois; Agro-geologic Study of Manganese, P. Nottin; Use of Zinc as a Catalytic Fertilizer, M. Javillier; Researches in Regard to Inorganic Fertilizers for Sugar Beets, A. Vivier; The Inheritance of Certain Imperfections in Gluten, L. Vuaflart; Effect of Bichromate of Potash upon Milk when used at a Preservative, M. Vuaflard; Nitrogen and Phosphoric Acid in Wheat and Wheat Flour, L. Vuaflart; The Effect of Static Electricity upon the Development, Yield, and Composition of the Sugar Beet, R. Trnka; The Fertilizing Effect of Palmaer Phosphate on Peat Soils, H. von Feilitzen; Remarks on the Theory Concerning the Action of Fertilizers, A. Rindell; The Relative Effect on Plant Growth (a) of Sodium Carbonate, and (b) of Imperviousness in Soils, J. W. Leather; Determination of Permeability of Soils to Water, J. W. Leather; Contribution to the Colloid Chemistry of Milk, G. Wiegner; Stimulation of the Action of Calcium Cyanamid upon the Yield of Cultivated Plants by Iron, A. Stutzer; The Composition of Kelps, J. W. Turrentine; The Salines of the United States as a Source of Potash, J. W. Turrentine, R. F. Gardner, and A. R. Merz; Organic Soil Constituents in Their Relation to Soil Fertility, O. Schreiner; Some Constituents of Humus, E. C. Shorey; Effect of Histidin and Arginin as Soil Constituents, J. J. Skinner; Normal and Abnormal Constituents of Soil Organic Matter, E. C. Lathrop; Biochemical Factors in Soils, M. X. Sullivan; The Extraction of Potash from Silicate Rocks, W. H. Ross; Alunite as a Source of Potash, W. H. Waggaman; Radioactivity of Soils, R. B. Moore; The Use of Ground Rocks and Ground Minerals as Fertilizers, W. O. Robinson and W. H. Fry; The Chemical Composition of Important Soil Types East of the Mississippi, W. O. Robinson; Sponge Spicules in Certain Soils, Comparison of Rock Grinding With Balls and Cylinders, and Movement of Soil Moisture, R. O. E. Davis; Distribution of Fine Particles in the Soil, R. O. E. Davis and C. C. Fletcher; The Composition of the Soil Solution, F. K. Cameron; The Rôle of the Lysimeter in Soil Solution Studies, F. K. Cameron; The Phosphate Deposits of Continental North America, L. P. Brown; The Effect of Lime upon the Alkali Tolerance of Wheat Seedlings, J. A. LeClerc and J. F. Breazeale; Behavior of Amino Acids in the Soil, S. L. Jodidi; Soil Exchange Experiments on the Composition of Wheat, J. A. LeClerc and P. A. Yoder; Factors Relating to the Availability of Nitrogenous Plant Foods, J. G. Lipman, A. W. Blair, I. L. Owen, and H. C. McLean. The officers of the section were Frank K. Cameron, president; H. J. Wheeler, vice president; and J. A. Le Clerc, seretary.

The Ninth International Congress is to be held in 1915 in Russia.

EXPERIMENT STATION RECORD.

VOL. XXVII. ABSTRACT NUMBER. No. 6.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Studies in protein hydrolysis, F. W. FOREMAN (*Jour. Agr. Sci., 4 (1912), No. 4, pp. 430–433*).—As a result of this research it was found that by using dry salts for esterification, in place of the watery sirup which is usually employed, a great saving of time and trouble may be effected in the early stages of the process, and furthermore that a very satisfactory esterification may be obtained. This is due to the fact that alcohol when used will prevent the reverse effect of the small amount of water produced. The complete removal of water from such a sirup is prevented by the presence of an excess of free hydrochloric acid, and the removal of the esterification water may therefore be more efficiently secured when an alcoholic solution containing the ester hydrochlorids alone, as in the author's process, is evaporated.

It is further claimed for this process that owing to the solubility of the ester hydrochlorids in chloroform and the freedom of their solution from hydrochloric acid the presence of a small quantity of anhydrous baryta, without the addition of water, will efficiently liberate the esters from their hydrochlorids. The yields obtained are as high as those obtained by the older methods.

In regard to the investigation of proteins with the formol-titrametric method, F. OBERMAYER and R. WILHELM (*Biochem. Ztschr., 38 (1911), No. 3–4, pp. 331–343; abs. in Zentbl. Expt. Med., 1 (1912), No. 4, pp. 157, 158; Zentbl. Biochem. u. Biophys., 13 (1912), No. 1–2, p. 6*).—It was noted that when adding a neutral solution of formaldehyde to an aqueous solution of a protein which reacted neutral to litmus, a strong acid reaction developed. According to this, the amino acids and ammonia are not the only substances which can be determined by the Sörenson method.

The tests were conducted with carefully purified proteins which gave a negative reaction with Nessler's reagent and only a faint brown tinge with the quinone test for amino acids. The results bring out the fact that the method will yield constants for certain classes of proteins, which are more or less characteristic. If the value found for total nitrogen by the Kjeldahl method is divided by the value obtained in the formaldehyde titration a figure is obtained which the authors term the amino index of the protein in question.

It was found that the amino index of globulin is greater than that of albumin. Globulin from horse serum had an index of 20 while albumin from the same source had one of 13. The figures for the proteins from the different mammalia were found to differ only slightly among themselves.

Following proteolysis in cheese with the formol-titrametric method, O. GRATZ (*Ztschr. Untersuch. Nahr. u. Genussmtl., 23 (1912), No. 8, pp. 379–384*).—The course of proteolysis was followed in Emmental, Limburg, Edam, Camem-

bert, Roquefort, Gorgonzola and Liptau cheeses with the formol-titrametric method.

The results showed that the degree of protein degeneration can be determined with this method as well as with the precipitation method. One method, however, supplements the other. In this work the formol titration is conducted in the residue from the ammonia distillation and in which 50 cc. of cheese extract is diluted with 100 cc. of water and distilled with barium carbonate. The carbonates and phosphates remaining in the residue are removed by precipitation with 2 cc. of a saturated barium chlorid solution and 5 cc. of a one-fourth-normal barium hydrate solution. The mixture is then made up to 200 cc., filtered after standing for 15 minutes, and 100 cc. of filtrate neutralized with hydrochloric acid toward litmus and used for the formol-titration.

A brief investigation on the estimation of lecithin, R. C. Collison (*Jour. Biol. Chem., 11 (1912), No. 3, pp. 217–220*).—According to the results obtained with brain and liver tissue it would seem that the straight extraction method with anhydrous alcohol and anhydrous ether is preferable to the acid-chloroform-water method which is recommended by Koch (E. S. R., 22, p. 411). The results obtained with the crude reagents and the acid-chloroform-water mixture were found to be uniformly higher, probably due to the inclusion of inorganic or other forms of nonlipoid phosphorus.

Tests in regard to the behavior of pentoses in fermenting mixtures, W. E. Cross and B. Tollens (*Jour. Landw., 59 (1911), No. 4, pp. 419–428; abs. in Zentbl. Biochem. u. Biophys., 13 (1912), No. 1–2, p. 59*).—This work was carried out with arabinose, xylose, methyl pentoses, rhamnose, and extracts made from brewers' grains. These sugars were fermented in solutions containing dextrose and without dextrose. The ferment used was yeast. The nutrient solution in one case was yeast water and in the other one artificially prepared and containing very little organic matter.

The pentose solutions which were free from hexoses were stable, showing no change after a long time, and those solutions containing dextrose and yeast water were also not affected. On the other hand the solutions having the artificial nutrients present and hexoses showed a loss in pentose content after fermentation. The points made in the experiments are that pentoses during fermentation may be utilized for producing new cells when such products as yeast water contains are not present.

The mannit obtained from asparagus juice, B. Tollens (*Jour. Landw., 59 (1911), No. 4, pp. 429, 430; abs. in Zentbl. Biochem. u. Biophys., 13 (1912), No. 1–2, p. 6*).—Wichers and Tollens in the work previously noted (E. S. R., 24, p. 509) could not obtain mannit in crystalline form from recently pressed juice. They now find that if this juice is allowed to stand for a time small needle-shaped crystals, which have a melting point of 167 to 168° C. and are optically inactive in an aqueous solution but optically active in a borax solution, are obtained. The specific rotation as recorded with the borax solution indicated mannit.

Studies on oxidizing enzyms, Bernard and Welter (*Ann. Jard. Bot. Buitenzorg. 2. ser., 10 (1912), pt. 1, pp. 1–58; abs. in Chem. Abs., 6 (1912), No. 9, p. 1162*).—Cleansed and sterile sea sand, pulverized glass, powdered pumice, and infusorial earth turn tincture of guaiac blue in the presence of hydrogen peroxid. Gypsum, calcium oxalate, marble dust, and starch also produce a blue color, but it is not so pronounced. Starch gave the weakest reactions. The oxidation of hydroquinone and pyrogallol in the presence of hydrogen peroxid can be accomplished by various substances, but not by traces of iron or manganese.

"Starch paste with potassium iodid is not a suitable reagent for studying oxidases because hydrogen peroxid alone or organic peroxids set free active oxygen under these conditions. Bleaching of blued guaiacum is not due to reducing substances but to inhibiting effect of hydrogen peroxid on oxidases. Alcoholic solutions of guaiacum develop peroxid very rapidly. Only large pieces of gum with little surface exposure should be used. Saturated alcoholic solutions of the gum seemed to change less rapidly. Tannin interferes with both direct and indirect oxidase (peroxidase) action, this effect being prevented by precipitating tannin with hide powder. Certain fruits, as *Carica papaya*, give an oxidase test only after ripening. The juice of certain green fruits when treated with hide powder then gave the oxidase test. Standard color solution of indigo carmin was used to make comparative determinations of amounts of oxidases in various parts of the tea plant as judged by the depth of the blue color due to the oxidation of guaiacum." "Direct oxidase is not an enzym in the strict sense of the term but is an organic peroxid as held by Bach and Chodat. The peroxidase from tea leaves is very resistent to heat and is not subsequently regenerated when allowed to stand. Mercuric chlorid, hydrocyanic acid, and solutions of mineral acids destroy the oxidizing action of tea leaves. Exposure to light seems to prevent formation of peroxid but has no effect upon the peroxidase preparation. Yeasts present in tea fermentation do not secrete any extracellular oxidases which are involved in the production of common tea."

In regard to the von Lorenz method for the determination of phosphorus, H. Neubauer and F. Lücker (*Ztschr. Analyt. Chem., 51 (1912), No. 3–4, pp. 161–175*).—By substituting acetone for alcohol and ether for washing the molybdate precipitate the cost of conducting this test can be much reduced.

The precipitate, which is obtained in the usual way, is collected in a Gooch crucible containing filter paper or on the Neubauer platinum sponge crucible, washed 4 times with a 2 per cent solution of ammonium nitrate and 3 times with acetone, and then placed in a vacuum desiccator at a pressure not greater than 150 mm. of mercury for ½ hour and weighed. If the weighing can not be done immediately, the crucible is placed in an ordinary desiccator over sulphuric acid until the weighing time. The results obtained compared well with those obtained by the usual method. The spent acetone may be recovered by dehydration with potassium carbonate.

Estimation of nitrites in potable waters, G. D. Elsdon (*Chem. News, 105 (1912), No. 2739, p. 243*).—"For the following reasons the author much prefers the Griess-Ilosvay reagent for testing for nitrites, both qualitatively and quantitatively: (1) The color is practically steady after standing about 2 hours, and it is easy to compare and match. (2) It is not affected by ferrous and ferric salts. (3) Only one solution has to be added, and this will keep for months without decomposition.

"The starch-iodid test only seems to have one good point, namely, that the solutions required are ordinary laboratory reagents."

Determination of calcium in the presence of magnesium, E. C. Carron (*Ann. Chim. Analyt., 17 (1912), No. 4, pp. 127–129; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 9, p. 460*).—Much difficulty is experienced in the separation of calcium from magnesium by the usual methods, particularly where a large excess of magnesium is present. The following method is recommended as being an accurate one for this purpose:

"The solution of the chlorids—which may contain ammonium chlorid and ammonia—is concentrated to 60 or 80 cc. and made slightly alkaline. After the addition of 20 cc. of ammonium bisulphite solution—prepared by saturating

aqueous ammonia (22° B.) with sulphur dioxid—the liquid is heated to about 90° C. and, upon the appearance of a crystalline precipitate, 20 cc. of ammonia solution (22° B.) are added and the mixture is well stirred. The calcium sulphite, precipitated (in crystalline form) in accordance with the equations: $CaCl_2+3NH_4HSO_3+NH_3=CaS_2O_5+2NH_4Cl+(NH_4)2SO_3+H_2O$, and $CaS_2O_5+2NH_3+H_2O=CaSO_3+(NH_4)_2SO_3$, is allowed to settle for an hour and is then filtered off, washed with hot, slightly ammoniacal water, dried, calcined in a muffle, and weighed as calcium sulphate; before incineration, the filter paper is moistened with a saturated solution of ammonium sulphate containing free sulphuric acid to prevent the formation of calcium sulphid. After the complete expulsion of the free and combined sulphurous acid from the filtrate, the magnesium is determined by precipitation with sodium phosphate in the usual manner."

The method requires about 3 hours for each determination of calcium. Zinc, nickel, and cobalt when present do not influence the process. See also a previous note by Hinds (E. S. R., 26, p. 21).

A short method for the determination of soluble arsenic in commercial lead arsenates, B. E. CURRY and T. O. SMITH (*Jour. Indus. and Engin. Chem., 4 (1912), No. 3, pp. 198–201*).—The official method for soluble arsenic oxid requires 10 to 11 days, so that to economize time the following method, which only takes about 2 days in all and will give results as total soluble arsenic, was devised:

An amount of moist commercial arsenate, corresponding to 2 gm. of dry substance, is placed in a flask with 500 cc. of water and agitated continuously in a thermostat at 20° C. for 18 hours by means of a hot-air engine. The mixture is then filtered and a small portion of the filtrate tested for arsenious oxid. If present, 200 cc. of filtrate is taken, some bicarbonate of soda and starch added, and titrated with a standard iodin solution. The solution is then treated with 5 cc. of sulphuric acid and 1 gm. of potassium iodid, evaporated to a bulk of from 40 to 50 cc., and then diluted to 150 cc. with water. If an excess of iodin is present, it may be removed by the addition of twentieth-normal sodium thiosulphate solution until no yellow color remains. The solution is now rendered slightly alkaline with sodium hydrate, then acid with dilute sulphuric acid, and alkaline again with sodium bicarbonate. The arsenite is then titrated with iodin solution, employing starch as the indicator. The solubility of lead arsenite for this procedure is less than it is in the official method, i. e., 0.151 with the former and 0.605 with the latter method. By deducting 0.151 from the results obtained with the method described the percentage of total soluble arsenic is obtained. The figures agree well with the official method when the results of both methods are corrected.

Determination of saltpeter in meat, J. TILLMANS and A. SPLITTGERBER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 23 (1912), No. 2, pp. 49–56; abs. in Ztschr. Angew. Chem., 25 (1912), No. 17, p. 852*).—Tests made with the brucin-sulphuric acid method and the diphenylamin sulphuric acid method with commercial samples and samples prepared with known potassium nitrate content show that both methods are sufficiently accurate for ordinary work. Where exact results are required the Schlösswig-Wagner method must be used. The literature is discussed.

Detection of alum in flour and bread, W. LENZ (*Apoth. Ztg., 26 (1911), No. 66, pp. 687–689; abs. in Chem. Ztg., 35 (1911), No. 130, Repert., p. 541*).—The method is as follows: Two gm. of flour is mixed in a test tube with 3 cc. of water and 1 cc. of a 1 per cent solution of hematoxylin in 50 per cent alcohol, and then thoroughly shaken with 10 cc. of a saturated solution of sodium

chlorid. Pure flour settles to the bottom of the tube as a flesh-colored mass with a supernatant yellow fluid, while flour containing alum gives a slatish to blue-violet color.

For baked goods a microscopic examination of the ash is necessary. The ash is dissolved in hydrochloric acid, precipitated with ammonium hydrate, and redissolved in hydrochloric acid. To the resulting solution some potassium bisulphate is added. If the resulting precipitate contains octohedral crystals, which are characteristic of the salts of aluminum, alum is present. The crystals must be detected with the microscope.

A report on the determination of the amount of tin in tinplate used for canning preserved food, W. W. O. BEVERIDGE (*Jour. Roy. Army Med. Corps, 16 (1911), No. 2, pp. 140–160, figs. 2*).—This work presents the results of some examinations of tinplate destined for the manufacture of cans for holding preserved fruits, etc. As a preliminary test for the amount of erosion in a given can the author utilized the Walker gelatin-potassium ferricyanid test and the following method for determining the amount of tin present in the tinplate: Pieces of plate 1 sq. in. in size are subjected to the action of a warm solution of dry chlorin gas in carbon tetrachlorid or in fuming stannic chlorid to remove the tin, then washed and reweighed, the tin present in the sample thus being determined by difference.

For determining the variations in the coating of tin the author describes a method, from which the following conclusions are drawn: "(1) For cans to hold preserved meats, such as corned beef, the amount of tin per base-box of 112 plates measuring 14 by 20 in. should be at least 2.5 lbs., or an amount not falling anywhere below 0.0361 gm. to the square inch (both sides), to insure a fair distribution of the tin. (2) For cans intended for such foods as fruits, jams, etc., owing to their acid nature, and for meat extracts, essences, and highly salted foods, a layer of tin equivalent to not less than 3.5 lbs. per base-box, or 0.0506 gm. per square inch (both sides). (3) For dried foods such as biscuits, meal, etc., probably 2.25 lbs. or 0.0325 gm. per square inch would be quite sufficient. (4) In every case one-twentieth of the surface of the top, bottom, and sides respectively should be taken for analysis from the same can, and the lowest amount found on a given surface quoted. (5) In all cases the layer of tin should be continuous and as evenly laid as possible. (6) There should be no fissures and any surface extensively riddled with pin-holes as shown by the Walker test should lead to rejection of the plate. It is fair to state, however, that at the present time a certain number of pin-holes appear to be inevitable, but with improved methods of plating they are likely in the future to be almost entirely eliminated. (7) The custom of painting the outside of the cans to prevent rust is a good one, and should be continued."

Detection of saponin in beverages and foods by the hemolytic method, C. SORMANI (*Ztschr. Untersuch. Nahr. u. Genussmtl., 23 (1912), No. 11, pp. 561–566*).—The author concludes that the hemolytic methods, especially Rusconi's procedure, yields far better results than the usual chemical methods for detecting saponin in foods, etc.

Detection of saponin, J. RÜHLE (*Ztschr. Untersuch. Nahr. u. Genussmtl., 23 (1912), No. 11, pp. 566–577*).—Vamvaka's method for the detection of saponin and for differentiating saponin from glycyrrhizin is not considered accurate. The color reactions with concentrated sulphuric acid and Fröhde's reaction (100 cc. of concentrated sulphuric acid +1 gm. of ammonium molybdate) are not always reliable, while the reactions obtained with α-naphthol, thymol, and purified oxgall, which are dependent upon the presence of sugar, are of no value at all. In these tests the hemolytic test was the only one which gave entirely satisfactory results.

The behavior of milk towards ammonium sulphate and a new method for determining lactose, E. SALKOWSKI (*Hoppe-Seyler's Ztschr. Physiol. Chem., 78 (1912), No. 2, pp. 89–95*).—This article deals with the use of ammonium sulphate as a reagent for precipitating the proteins from milk for the purpose of determining lactose in the filtrate. The method is as follows: Fifty cc. of milk is placed in a wide-mouthed, graduated, stoppered glass cylinder of from 150 to 200 cc. capacity and treated with 17.5 gm. of ammonium sulphate, then shaken thoroughly, filled up to the 100 cc. mark with a saturated solution of ammonium sulphate in water, mixed, and filtered through a 16-cm. filter. In a few minutes enough filtrate is obtained for the polariscopic determination of lactose.

In regard to the fat of woman's milk, W. ARNOLD (*Ztschr. Untersuch. Nahr. u. Genussmtl., 23 (1912), No. 9, pp. 433–440*).—The chemical composition of the fat in woman's milk differs from that contained in cow's milk, not only in the amount of water-soluble substances present but also in the composition of these acids. Cow's milk fat contains a larger amount of butyric and less caproic acids, and a little caprylic acid, corresponding to a middle molecular weight of from 100 to 106, while the water-soluble fatty acids of human milk fat contain a larger amount of caprylic and caproic acid, and possibly of butyric acid, closely correspond to the acids of coconut fat, and have a molecular weight of 128.9, Furthermore, the oleic acid content of human milk fat is higher than that of cow's milk fat. A close agreement, however, is found among the nonvolatile fatty acids (insoluble in water). Figures for the molecular weight varying from 259 to 262 were obtained. On the other hand, the iodin numbers of the nonvolatile fatty acids of human milk fat are higher than those of cow's milk fat. A mixture of 14 parts of coconut fat and 86 parts of hog fat (lard) gave analytical data which corresponded closely to those with the fat contained in human milk.

The composition and examination of cow's and goat's milk with particular reference to the refraction of calcium-chlorid serum, K. ALPERS (*Ztschr. Untersuch. Nahr. u. Genussmtl., 23 (1912), No. 10, pp. 497–513*).—The refraction of the calcium-chlorid serum of individual milks varied between 35.8 and 41.3° at a temperature of 17.5° C. In one case, however, where the milk came from an inflamed udder it was 34°, and the milk from cows in heat in some cases showed marked variations in composition. The daily variation of the refraction, however, never exceeded 1.4°. As an average refraction, from 126 samples of milk taken in the barn the figure 39.11° was obtained. This method, according to the author, is a very valuable one for detecting added water to milk, but care must be taken in all cases not to overrate its value.

With goat's milk the refractions were from 34.7 to 40.3, with an average of 38°. The average specific gravity of goat's milk was 1.03, the average fat content 4.3, and the fat-free dry substance 8.89 per cent.

The most important enzym reactions for differentiating boiled from raw milk, especially Schardinger's reaction, A. GRÖGER (*Die wichtigsten Enzymreaktionen zur Unterscheidung roher und gekochter Milch. Inaug. Diss., Univ. Leipsic, 1911, pp. 61*).—Although Rothenfusser's reaction with paraphenylenediamin hydrochlorid in the hands of skilled persons is a good method for differentiating boiled from raw milk, it can not be recommended for use by the laity. The preparation of a serum, however, in this method is not necessary, as the boiled milk after standing for a time with this reagent will show a positive coloration. Taking everything into consideration the author believes that the Webber-Arnold guaiac reaction should be given the preference. Schardinger's reaction, on account of its requiring a water bath, is only of use in the laboratory, and since the reaction is influenced by the presence of much acid (as in

colostrum and old milk) it is better to conduct it with an alcoholic methylene blue-formaldehyde solution. The reaction will not determine whether or not the cow is in a new period of lactation.

Are alkalinity and peroxidase synonymous? W. D. KOOPER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 23 (1912), No. 1, pp. 1–13; abs. in Ztschr. Angew. Chem., 25 (1912), No. 17, p. 853*).—The degree of alkalinity, that is, the amount of normal sulphuric acid required to discharge the violet color produced by Rothenfusser's reagent for fresh milk, was 110.1 cc., and like the degree of the acidity of milk it varies. In colostrum the degree of alkalinity is greater than in normal milk, but the amount of sulphuric acid required falls as the period of lactation goes on. In goat's milk the alkalinity degree is higher (120) than in cow's milk. The author believes peroxidase and alkalinity synonymous.

In regard to the guaiac test, K. SCHERN and W. SCHELLHASE (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 13, pp. 221–223*).—A discussion of Kühn's work (E. S. R., 26, p. 712), with some additional data in regard to the influence of hydrogen peroxid on the test. It was found that when hydrogen peroxid is added to the milk the guaiac reaction is influenced considerably, but not when the guaiac-guaiacol reagent is employed. Boiled sterile milk, without regard to time, does not give a positive test with the guaiac-guaiacol reagent.

Source of error in the determination of the Polenske number, W. ARNOLD (*Ztschr. Untersuch. Nahr. u. Genussmtl., 23 (1912), No. 8, pp. 389–391*).—According to the author, the difficulties encountered lie not with the method but with the manipulator who neglects certain criterions laid down by the author, and which it is absolutely necessary to follow in order to get correct results. The method is described in detail.

A new method for determining sugar, I. BANG (*Lunds Univ. Årsskr., n. ser., Sect. 2, 7 (1911), No. 8, pp. 1–10, pl. 1*).—The original Bang method is open to the objections that the titration solutions are very expensive, the copper solution is not stable, and an incorrect titration made with a copper solution can not be corrected. Attempts were made to displace the potassium sulphocyanid with a cheaper salt, and potassium chlorid was found to be a good substitute, it also forming colorless compounds with cuprous oxid, but had the disadvantage of being able to hold only small amounts of cuprous oxid in the solution. It was also noted in this work that better results—end point determination, etc.—could be obtained if the cuprous oxid was titrated directly and not the unreduced cupric oxid, as in the older method, consequently iodin 1/100-normal was selected instead of hydroxylamin.

The other solutions necessary are as follows: (a) Potassium bicarbonate 160 gm., potassium carbonate 100 gm., and potassium chlorid 66 gm. are dissolved in 700 cc. of water. The potassium bicarbonate is dissolved first, then the other salts, followed by 100 cc. of a 4.4 per cent copper sulphate solution, are added, and the solution filled to the 1,000 cc. mark with water. From this stock solution 300 cc. is diluted to the 1,000 cc. mark with a saturated solution of potassium chlorid. The latter solution, which is stable, should only be employed after standing for a few hours. (b) A solution of soluble starch, which consists of 1 gm. of soluble starch in a saturated solution of potassium chlorid.

The method is conducted as follows: Two cc. of the sugar solution, which is only one-sixth as strong as the old method calls for, is placed in a 100 cc. Jena flask, which has its upper rim removed, with 55 cc. of a copper solution. A rubber tube about 5 cm. long is pulled over the neck of the flask until it stands about two-thirds above the flask. The solution is boiled for 3 minutes, the tube clamped with a pinchcock, and the boiling continued to the end of the 3-minute period. The flask is then removed quickly from the flame and cooled, the rub-

ber hose removed, 1 cc. of 1 per cent starch solution added, and titrated with the iodin solution until from 2 to 4 drops produce a deep blue color which persists for from 20 to 30 seconds. The number of cubic centimeters of iodin solution used in the above titration, divided by 0.267, will give the amount of sugar present in milligrams.

The Andrlík urea method of polarization [in the Clerget process] for cane products, W. E. Cross and W. G. Taggart (*Internat. Sugar Jour., 13 (1911), No. 156, pp. 662–668; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 1, p. 37*).—While urea and betain inhibit inversion to some extent at 28° C., the inhibition is not sufficient to allow a polarization to be made before inversion begins. At 20° inversion is much slower, but even at this temperature inversion takes place before a reading can be taken. "Clerget determinations were made, using pure sucrose solutions and a temperature of 20°, with the result that whereas the readings made in the ordinary way gave a value of 100 per cent, with the Andrlík polarization one of 99.41 per cent was obtained. When invert sugar was present, the ordinary Clerget value was 95.97, and using the Andrlík polarization, 99.75." At some lower temperature, perhaps 15°, the authors believe that the method could be employed, but such a temperature is impracticable in cane-producing countries.

Determination of sucrose in cane molasses and the double polarization method, using invertase and acid as hydrolysts, J. P. Ogilvie (*Internat. Sugar Jour., 14 (1912), No. 158, pp. 89–93; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 5, pp. 244, 245*).—Continuing previous work (E. S. R., 25, p. 208) the invertase method has been extended to the examination of cane molasses.

The results show "(1) that if in the acid hydrolysis method, the generally employed procedure of using the alkaline direct polarization be adopted, the results may be too high to the extent of 0.4 to 1.3 per cent, according to the impurity of the product; (2) that if in the acid hydrolysis method the neutral direct polarization, in place of the alkaline, be used, the results are nearer the truth, but may again be too high, especially when much reducing sugars are present; and (3) that if in the acid hydrolysis method, the acid direct polarization, as recommended by Andrlík or Pellet, be used, then correct results are obtained."

In the case of beet-sugar molasses the presence of amino acids vitiates the polariscopic readings, while with cane molasses reducing sugars cause the changes. When basic lead acetate is present the right-handed rotation of a cane molasses solution is increased considerably, while after inversion when the solution is acid this activity is removed and levo-rotation is increased. Therefore the difference between the direct and indirect readings is not simply due to the hydrolized sucrose.

[Report of the chemists], A. E. Vinson and W. H. Ross (*Arizona Sta. Rpt. 1911, pp. 557–562, fig. 1*).—An illustrated description of an electrical heater for ether extraction is given and its advantages over the old form of extraction apparatus enumerated. Analyses of Salton Sea water are also reported.

Commercial methods of canning meat, C. N. McBryde (*U. S. Dept. Agr. Yearbook 1911, pp. 383–390, pls. 3*).—This deals with the historical development of the meat canning industry and describes briefly and illustrates the methods practiced at the present day.

How to pack hominy free from black discoloration and processed so it will keep free from souring or starch hydrolysis (*Canner and Dried Fruit Packer, 34 (1912), No. 22, pp. 28, 30*).—For canning lye hominy 1 bu. of corn is placed in a kettle with 1½ gal. lye. The kettle is filled to within 6 in. of the top with water and cooked for 30 minutes or until the hulls can be easily removed with the fingers. The hominy is run into the hulling machine, feeding slowly, and from there into a washing machine, feeding gradually with a continuous

flow of water. It is then brought to the boiling-out kettle where it is cooked for 30 minutes, stirring constantly during the process. The product is filled into No. 3 cans, 14 oz. to the can, covered with a brine made with 21 lbs. salt to 200 gal. water, and processed for 2 hours at 240° F.

METEOROLOGY—WATER.

How about the weather? M. SCHMUCKER (*Wie Wird das Wetter? Dillingen, 1911, pp. 8+147*).—This book deals with a new theory of weather forecasting, based upon 25 years' observations on the relative motions of the sun, moon, and earth.

The moon and the weather in 1912, E. J. N. B. HINSELMANN (*Mond und Wetter im Jahre 1912. Hanover, 1912, pp. 17*).—The relation of the moon to the weather is discussed as well as weather predictions during 1912 based upon lunar observations. The value of such observations and predictions from the agricultural standpoint is also briefly discussed.

Influence of reservoirs on climate (*Prometheus, 23 (1912), No. 1161, Beibl., p. 66; abs. in Wasser u. Abwasser, 5 (1912), No. 9, pp. 376, 377*).—Observations, indicating a slight decrease and a moderation of extremes of temperature and an increase of fog as a result of evaporation from reservoirs, are reported.

A contribution to the sums of temperature in phenology, K. HEGYFOKY (*Met. Ztschr., 29 (1912), Nos. 5, pp. 210–217; 6, pp. 272–281*).—The author concludes that sums of temperature without knowledge of the temperature variations and factors (sunshine, moisture conditions, etc.) determining them are of no value in phenology.

Report of the Chief of the Weather Bureau, 1910–11 (*U. S. Dept. Agr., Weather Bur. Rpt. 1910–11, pp. 260, pls. 4*).—This contains an administrative report reviewing the work of the Weather Bureau during the fiscal year ended June 30, 1911, at Mount Weather research observatory, on forecasts and warnings, and of the river and flood observations and reports, marine, instrument, and climatological divisions, and tables giving a general summary of the weather conditions in the United States by months during the year 1910, list of observing stations and changes therein during 1910, sunshine in 1910, details of excessive precipitation in 1910, monthly and annual meteorological summaries in 1910, monthly and annual amounts of precipitation in 1910, and monthly and seasonal snowfall in 1910–11.

"Special attention was given during the year to warnings for the benefit of shippers and growers of perishable products. Forecasts were sent out daily from a number of our larger stations, giving the probable temperatures likely to be encountered by perishable goods shipped in any direction.

"Substations were established in the cranberry marshes of Massachusetts, in the citrus fruit districts of Florida, and in some of the orchard districts of Washington, Oregon, Idaho, Utah, Colorado, and California. During the frost season special reports are sent from these substations to the forecast center, where they are used in the preparation of a special forecast in the afternoon or early evening, supplementing the regular morning forecast. By this means the growers are enabled to take such precautionary measures as are available to protect their crops. In Washington, Oregon, Idaho, Utah, Florida, and California the fruit growers smudge and fire when necessary, while in the cranberry regions the cranberry growers flood their bogs to prevent injury. In this line of work it has been the policy to furnish the individual with information particularly applicable to his orchard rather than to have him depend upon a general forecast that would apply to a large section but could not accurately cover the section in detail. Effort has also been made to encourage the grow-

ers to organize and employ protective measures in saving their crops from frosts and freezes. Thus far the work has been successful beyond expectation."

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER, R. N. HALLOWELL, and H. W. ANGIER (*Massachusetts Sta. Met. Buls. 281, 282, pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during May and June, 1912. The data are briefly discussed in general notes on the weather of each month.

Report on weather forecasts, 1911, D. A. GILCHRIST (*County Northumb. Ed. Com. Bul. 18, 1912, pp. 82–84*).—A brief summary is given of weather forecasts for agricultural purposes issued by the English Meteorological Office during the summer of 1911, and of records at Cockle Park, Northumberland, of the weather conditions for a few days immediately following the receipt of the forecasts. This summary shows that of 14 such forecasts 12 were correct.

The weather of 1911, D. A. GILCHRIST (*County Northumb. Ed. Com. Bul. 18, 1912, pp. 84–90*).—Observations on temperature, precipitation, and sunshine at Cockle Park and a number of other places in Northumberland are summarized. Observations on the temperature of cultivated and uncultivated soil are also given.

It was found that changes in temperature were less sudden in cultivated soil than in uncultivated soil. This is attributed to conservation of moisture in the cultivated soil. Samples taken at the same time showed 13.01 per cent moisture in the cultivated soil and only 9.53 per cent in the uncultivated soil.

Variations in our climate, A. B. MACDOWALL (*Symons' Met. Mag., 47 (1912), No. 554, p. 25*).—A study of the number of frost days in winter at Greenwich from 1841 to 1911, by adding them for the 50-year periods ending 1891, 1892, and so on to 1911, indicated "a general decline in the figures and the last is the lowest. That is, the last 50 winters, September to May, had a smaller number of frost days than any previous 50 consecutive winters since 1841."

The drought of 1911, M. KERSHAW (*Ann. Sci. Bul. Roy. Agr. Col. Cirencester, 1911, No. 3, pp. 49–70, figs. 5*).—The nature and effects of this very severe drought, especially in the vicinity of Cirencester, are described. The total rainfall for the year was 23.31 in., 7.43 in. below the average. The total number of hours of sunshine was 1,715, 207 in excess of the average. The temperature of the growing season was much above the average.

The average annual distribution of rainfall in Hungary, 1901–1910, E. HÉJÁS (*Vizügyi Közlem., 2 (1912), No. 2; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 6, pp. 1267–1269*).—This article contains a series of rainfall maps, describes the methods of making the rainfall observations, and discusses the distribution of rainfall in Hungary with reference to altitude, form, and position of the mountains, distance from the sea, and other topographic and physiographic features.

Character of the summer rains of North Germany, G. HELLMANN (*Sitzber. K. Preuss. Akad. Wiss., 1912, XVIII, pp. 282–303, figs. 4*).—This is a study of the amount and distribution of these rains.

Snow limits in different climates, V. PASCHINGER (*Mitt. Justus Perthes' Geogr. Anst., 1912, Ergänzungsh. 173, pp. 93, pls. 5, fig. 1*).—Detailed data regarding the permanent snow fields of the world are presented and their relation to climate is discussed.

The value of snow surveys as related to irrigation projects, A. H. THIESSEN (*U. S. Dept. Agr. Yearbook 1911, pp. 391–396, pls. 6, fig. 1*).—This article is based upon a snow survey of the Maple Creek watershed (E. S. R., 27, p. 415), near Provo, Utah. The value of such a survey from the standpoints of the irrigating farmer and the engineer is briefly discussed.

"A survey of this character is worth much more than the certainty it gives the irrigator regarding the future of his crop or the knowledge as to what crop he should plant. It eliminates his products from that class whose amount of production is more or less problematical. It tends to steady prices and, in addition to the taking away of these uncertain features, gives a crop, although not matured, a money value which it would not have, to such a great measure at least, if the water supply were not known."

The winds of the United States and their economic uses, P. C. DAY (*U. S. Dept. Agr. Yearbook 1911, pp. 337–350, pls. 7, figs. 2*).—This article contains and discusses a series of charts "showing the average hourly velocities of the wind and its direction throughout the various portions of the country and for special months of the year and hours of the day, with diagrams indicating the daily march of the winds and their variations at different levels." The data from which these charts were prepared are based mainly upon records for the 20-year period, 1891 to 1910, inclusive.

The economic use of the wind in windmills, for production of electrical energy, and in aviation is briefly discussed.

A more detailed paper on the subject is in course of preparation.

Subsoil water of central United States, W J MCGEE (*U. S. Dept. Agr. Yearbook 1911, pp. 479–490*).—This article is based upon data obtained through the crop reporters of the Department of Agriculture, and deals specifically with changes in level of water in wells in Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, Ohio, Tennessee, and Wisconsin.

"The number of wells showing change in water table ranges from 64.9 per cent in lower Michigan and 62.3 per cent in Wisconsin to 31.3 per cent in Missouri, averaging 52.1 per cent. The average lowering of water table during the period of observation ranges gradually down from 3.87 ft. in Wisconsin and 3.45 in Minnesota to 1.94 ft. in Tennessee, and then drops to only 0.95 ft. in Missouri. . . . The mean rate of lowering per decade for the 9 States excluding Missouri (1.315 ft.) is equivalent to a total lowering of 10.5 ft. in the 80 years which have elapsed since permanent settlement and cultivation began to extend into Illinois and Wisconsin and on into Iowa and Missouri." Although part of the lowering may be ascribed to special causes, "it seems clear that the records broadly indicate a secular lowering of the subsoil-water level, presumably due to clearing and cultivation of the land. . . .

"The results are in accord with common knowledge—of the failing of springs and wells following settlement, of the dwindling and disappearance of brooks, of the advancing destruction by floods due to increased surface run-off during and after storms, of the increasing difficulty in obtaining domestic water supply for farms, villages, towns, and cities, of the steadily growing danger of crop loss through drought, of the increasing need for irrigation in the humid section."

On the transport of mud by a river in flood, T. STEEL (*Chem. News, 105 (1912), No. 2743, p. 290*).—This note gives observations on the amount of mud carried by the River Yarra, Victoria, in flood, and the composition of mud carried by the Tweed River, New South Wales, in flood. The latter showed on the basis of dry matter 1.16 per cent lime, 0.2 per cent potash, 0.36 per cent phosphoric acid, and 0.48 per cent nitrogen.

Experiments on the removal of manganese from ground water, THIESING (*Mitt. K. Prüfungsanst. Wasserver. u. Abwässer. Berlin, 1912, No. 16, pp. 210–296, figs. 16*).—From the results of these experiments the author concludes that manganese in the form of carbonate can be easily removed by aeration and filtration. The methods and precautions to be observed are fully discussed.

Influence of the hardness of water on its suitability for drinking purposes (*Prometheus, 23 (1911), No. 1157, p. 207; abs. in Wasser u. Abwasser, 5 (1912),*

No. 9, p. 380).—Reference is made to investigations by Wagner from which the conclusion is drawn that drinking water with a very high degree of hardness may be used without danger of injury to health. It is shown that many of the more common foods contain lime corresponding to a much higher degree of hardness than is often found in drinking water.

The hygienic value of soft water (*Sanit. Rec., 46 (1910), p. 448; abs. in Wasser u. Abwasser, 5 (1912), No. 9, pp. 380, 381*).—In this article it is maintained that a high degree of hardness in water due to lime and inorganic substances is injurious to health, favoring goiter and rheumatism and hindering digestion.

Disinfection of drinking water with chlorid of lime, GRIMM (*Mitt. K. Prüfungsanst. Wasserver. u. Abwässer. Berlin, 1912, No. 16, pp. 297–334*).—Experience with this method of purification in the United States, England, and Germany is reviewed, and it is stated that this experience shows that two parts of chlorid of lime per million of water acting for 24 hours will completely disinfect only water which contains a small amount of organic matter.

Wholesome water in the country, F. H. BILLINGS (*Sci. Amer., 107 (1912), No. 2, p. 33, fig. 1*).—The dangers of pollution of country water supplies and how they may be avoided are briefly discussed.

Sewage disposal in rural districts, A. RODWELL (*Surveyor, 42 (1912), No. 1072, pp. 161, 162*).—Simple methods adapted to country houses and small villages and towns are briefly described.

Sewage treatment.—Advantages of land over artificial schemes, J. MANLEY (*Surveyor, 42 (1912), No. 1072, pp. 162, 163*).—A number of examples, mostly English, of successful use of land treatment are cited.

Sewage and the farmer, W. T. SEDGWICK (*Sci. Amer., 107 (1912), No. 2, p. 38*).—The author, discussing the waste of nitrogen in present methods of sewage disposal, the farmer's interest in the matter, the objection to the use of sewage on the farm, and the effect on fish of withholding sewage, reaches the general conclusion "that, except in the more arid portions of the United States, the utilization of sewage in farming does not seem likely to increase at present. Consequently, we may have to look in the future for our supplies of food more to the sea and less to the land."

SOILS—FERTILIZERS.

Important American soils, J. A. BONSTEEL (*U. S. Dept. Agr. Yearbook 1911, pp. 223–236*).—As the dominant soil types, both as regards extent and crop adaptation, the author names and discusses (1) the Miami clay loam, the Marshall silt loam, the Carrington loam, and Fargo clay loam (E. S. R., 25, p. 625) of the Central States; (2) the Hagerstown loam (E. S. R., 25, p. 426) of the Appalachian Mountains and Plateau; and (3) the Norfolk fine sandy loam, the Orangeburg fine sandy loam (E. S. R., 26, p. 120), and the Houston black clay (E. S. R., 26, p. 517) of the coastal plain.

"These 8 soils will ultimately be found to cover nearly or quite one-fifth of the arable agricultural domain of the United States east of the ninety-eighth meridian, if the estimates based upon the extent of their acreage within areas covered by the soil surveys is not materially changed by the completion of additional surveys. Because of the great area of these few types, because each soil is preeminently adapted to the production of some great staple crop or group of such crops, because the problems attendant upon the production of each of such crops will be more easily solved upon such homogeneous soil areas than upon a diversity of minor types, the agriculture of the Nation is destined to be influ-

enced more and more by these soils and by the farmers engaged in their cultivation."

New Jersey soils in their relation to fertility and crop production, J. G. LIPMAN (*Ann. Rpt. N. J. Bd. Agr., 38 (1910), pp. 85–101*).—This is a popular discussion of the subject.

Geological maps before the German Agricultural Council, A. JENTZSCH (*Internat. Mitt. Bodenk., 2 (1912), No. 1, pp. 3–44*).—This has been noted from another source (E. S. R., 25, p. 798).

Regarding the constitution of concretions in red soils of northern Italy, E. BLANCK (*Mitt. Landw. Inst. Breslau, 6 (1911), No. 3, pp. 325–344*).—The author reviews the literature on the origin and composition of typical laterit and red soils, and reports a study of the chemical composition of concretions formed in the red soils of Italy in relation to the parent rock and as compared with laterit concretions.

The results showed that the concretions of the red soils of Italy are composed largely of calcium carbonate and bear a close relation to the limestone rock from which the soil is apparently derived. Laterit concretions, on the other hand, are shown to contain large amounts of iron as Fe_2O_3 derived from rocks of a ferruginous nature.

The author expresses the opinion that a study of the constitution and origin of concretionary deposits of soils may be expected to aid in the interpretation of the weathering processes of a given region.

Chemical and physical nature of red soils, E. BLANCK (*Jour. Landw., 60 (1912), No. 1, pp. 59–73; abs. in Chem. Abs., 6 (1912), No. 14, p. 1948; Jour. Chem. Soc. [London], 102 (1912), No. 595, II, pp. 482, 483*).—A chemical study of red laterite soils of the Mediterranean region and of the red soils of more northern regions, around Münzenberg, showed no essential differences in the content, solubility, or form of combination of the iron and aluminum. It was found, however, that the surface area (as determined by the modified Mitscherlich method) in proportion to the amount of ferric oxid and soluble alumina was greater in the Mediterranean red soils than in the Münzenberg soils. This is thought to be due partly to the collodial condition of the iron oxid.

The origin of sea marshes, SCHÜTTE (*Arb. Deut. Landw. Gesell., 1911, No. 178, pp. 49, figs. 19*).—This is an account of observations on the formation, causes of productiveness, fauna and flora, and agricultural value of the North Sea marshes.

Analyses of soils of German Southwest Africa, C. GRIMME (*Arb. Deut. Landw. Gesell., 1911, No. 197, pp. 128–135*).—In connection with a study of the grazing possibilities in German Southwest Africa, the author made physical and chemical analyses of samples of soil from seven different districts of the region. Taking one-tenth per cent as normal, the results showed that out of 24 soils, 11 lacked nitrogen, 8 phosphoric acid, and 1 potash. Two soils were deficient in lime.

Pumice soils, B. C. ASTON (*Jour. New Zeal. Dept. Agr., 4 (1912), No. 5, pp. 374–377, fig. 1*).—This article describes the physical characteristics and crop adaptation of pumice soils of the North Island, New Zealand, central volcanic plateau. The soils are derived from eruptive rocks which have undergone very little alteration by weathering processes. It is stated that although classified as coarse sands, these soils contain "a less amount of silica (which is in the combined state) and a larger amount of plant food than the majority of sands."

Methods of improvement depend largely on increasing the store of humus and applications of phosphatic fertilizers.

Rock and soil in relation to plant nutrition with special reference to the cementing material of sandstone, E. BLANCK (*Landw. Vers. Stat., 77*

(*1912*), *No. 3–4, pp. 129–216, pl. 1; abs. in Ztschr. Angew. Chem., 25 (1912), No. 40, p. 2085*).—The author reviews the literature bearing on this subject and reports pot experiments with oats and peas grown on sand and on freshly crushed sandstone of different kinds. It was found that the cementing material of the sandstones contained readily available plant food, which is largely lost during weathering, as illustrated by the results with sand, which is the extreme product of the weathering process.

Acid excretion of roots and the solubility of plant food constituents of the soil in water solutions of carbon dioxid, T. Pfeiffer and E. Blanck (*Landw. Vers. Stat., 77 (1912), No. 3–4, pp. 217–268*).—The authors critically review the work of other investigators on this subject and report the results of experiments on the assimilation of phosphoric acid from monocalcium phosphate and different phosphorites by oats, lupines, and peas, grown in pots, the soil in which was kept charged with carbon dioxid. The carbon dioxid was conducted under pressure into the soil through the ventilation tubes of the pots. The soil was completely saturated in this way three times a week. The water content of the soil was maintained at 10 per cent during the experiment.

The results showed that addition of carbon dioxid gave favorable results only with the easily soluble phosphates. The phosphorites required stronger acid solvents to render them available to plants. It was also observed that the assimilation of phosphoric acid was greater for the legumes than for oats. The addition of carbon dioxid did not offset this difference.

The general conclusion, therefore, is that the assimilative power of plant roots is not dependent alone upon the carbon dioxid given off, but that other organic acids play an important rôle.

The action of different solvents on the plant-food constituents of the soil, O. Engels (*Landw. Vers. Stat., 77 (1912), No. 3–4, pp. 269–304; abs. in Chem. Abs., 6 (1912), No. 14, pp. 1948, 1949*).—The author reviews previous investigations on the subject by others and reports results of studies of the relative solubility of phosphoric acid, potash, and lime of soils in 10 per cent hydrochloric acid, 2 per cent citric acid, water solutions of carbon dioxid, and distilled water, using four different soil types ranging from light sands to heavy clays. In order to determine the solubility of the plant-food constituents in the original, as distinguished from the absorbed state, the experiments were made (1) on the untreated soil and (2) after treatment with 18 per cent solutions of superphosphate and potassium sulphate.

It was found that, although the solubility of the plant-food constituents varied, there was a uniformity in the action of the solvents. The absorption of phosphoric acid and of potash also varied for the different soils, being higher for the heavy clay soils, which contained also the higher lime, iron oxid, and alumina contents, and decreasing for loess loam and sandy soils in the order named. The solubility of the absorbed phosphoric acid was much higher for the lighter soils with low lime content. This was also true for the solubility of the potash, although the difference in solubility was not so pronounced.

The solubility of phosphoric acid and potash in the water solutions of carbon dioxid was substantially greater than that in water, being twice as great in the case of phosphoric acid and increasing in the case of potash in sandy soil from 34.08 to 55.08 per cent. The difference was less marked in the heavier soils.

The 2 per cent solution of citric acid dissolved substantially all the absorbed phosphoric acid and 90 per cent of the potash in case of sandy soils, whereas with the three heavier soils considerable amounts of the phosphoric acid and about one-third of the potash remained fixed in the soil.

The author, therefore, concludes that a 2 per cent solution of citric acid is the most reliable solvent for determining the readily soluble mineral constituents of the soil in that, unlike the other solvents used, it gives equally reliable results for both phosphoric acid and potash.

Determinations of the value of plant food constituents in soils and fertilizers as dependent upon solubility, J. G. MASCHHAUPT and L. R. SINNIGE (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefstat. [Netherlands], 1912, No. 11, pp. 19–73*).—The author gives a critical review of investigations by Mitscherlich on this subject (E. S. R., 19, pp. 110, 911), and reports the results of his own studies of the solubility of different phosphates in saturated water solutions of carbon dioxid and in citric acid (2 per cent) by single and repeated extraction.

The results showed that continued extraction with fresh quantities of the solvents was a more reliable method of determining the solubility of the phosphates and their fertilizing value than a single extraction. The water solution of carbon dioxid is preferred to citric acid on account of the fact that it is the most important, although not the only, solvent at the disposal of the soil and the plant roots, although the contention of Mitscherlich, that the action of carbon dioxid solutions is similar to that of the roots in physiological processes of plant growth, is not accepted.

Remarks on absorptive saturated and unsaturated soils, A. RINDELL (*Separate from Pochvovièdièniе (Pédologie), 1912, No. 1, pp. 11*).—This is a brief critical discussion of the views of Ramann and of Gedroits (E. S. R., 26, p. 30).

The author holds that the classification of soils as absorptive saturated and unsaturated is too indefinite to be of value, except as denoting whether a soil is rich or poor in absorptive combined bases. The judging of the absorptive properties of soils by their chemical behavior toward neutral salt solutions is also of no value without a knowledge of the kind of bases absorbed.

The relation of evaporation to the water content of the soil at the time of wilting, W. H. BROWN (*Plant World, 15 (1912), No. 6, pp. 121–134*).—Experiments to determine the relation between the evaporating power of the air and the percentage of water in the soil at the time of wilting of plants of *Martynia louisiana*, *Physalis angulata*, *Tropaeolum majus*, and *Vicia faba*, are reported.

The plants were grown "first in the open, exposed to the direct rays of the sun; second, under a lath shelter; third, in a room within a thick-walled adobe house; fourth, in a glass chamber in the same room, the air in this chamber being kept nearly saturated with moisture." The soil used was a mixture of equal parts, by dry volume, of clay-loam and sand with a water-holding capacity of 31.4 per cent of the weight of dry soil.

The results of these studies showed that the percentage of soil moisture at the time of wilting of the plants grown under the same conditions and in the same soil varied "with the rate of evaporation at the time of wilting, providing, however that, in the case of altered conditions, the plant is not allowed time enough under the new evaporation rate to become physiologically altered.

"This residual moisture content of the soil at the time of wilting varies according to the atmospheric conditions under which the plant has been grown and appears to be increased by excessive soil temperatures."

The moisture content of the soil at the time of wilting varied among the different plants "within but comparatively narrow limits for any given evaporating power of the air during the hour preceding wilting."

Data and observations on the salt content of drainage waters of the polders of North Netherlands, A. D. BERKHOUT (*Cultura, 24 (1912), No. 286, pp. 227–232, fig. 1*).—Determinations were made of the sodium-chlorid content of

the drainage waters and polder soils surrounding Westerkogge, Netherlands, with a view of ascertaining whether sufficient quantities were present to injure vegetation. The salt content in the drainage water varied from 0.1 to 10.82 gm. per liter, that in the surface soil from 0.005 to 0.051 per cent, and that in the subsoil from 0.005 to 0.140 per cent. It is not believed that these quantities were injurious to the vegetation.

The influence on soil temperature of additions of sand to moor soils, H. VON FEILITZEN (*Internat. Mitt. Bodenk., 2 (1912), No. 1, pp. 45–52, figs. 2*).—Tests of the influence on the temperature of moor soils of a sand layer of 1,500 cubic meters per hectare (about 794 cu. yds. per acre), as compared with mixing sand with the soil at the rate of 500 cubic meters per hectare, are reported. The results show that the temperature was increased much more markedly by the layer of sand than by mixing. Mixing the sand with the soil increased the temperature early in spring, but thereafter had no effect.

Soil bacteriology in agriculture, C. B. LIPMAN (*Cal. Cult., 38 (1912), No. 26, pp. 771–773, 779*).—This article summarizes concisely and indicates the practical bearing of what investigation has shown to be the relations of bacterial activity in the soil to aeration, water, temperature, humus, manures and fertilizers, sulphur and iron, carbon dioxid, soil inoculation, and sterilization.

Relation of soil bacteria to evaporation, C. HOFFMANN (*Wisconsin Sta. Research Bul. 23, pp. 183–215, fig. 1*).—Preliminary investigations having shown that Stigell's method of studying the relation of bacterial activity to evaporation in the soil (E. S. R., 20, p. 620) gave contradictory results, the author adopted the following method of procedure:

Five hundred or 600 gm. of air-dried soil, passed through a 12-mesh sieve, was placed in circular dishes either 19.1 or 21 cm. in diameter, making, when uniformly packed and leveled, a soil layer 2.8 cm. deep in the larger dishes and 3.2 cm. in the smaller dishes. "To each of the plates were then added by means of a 50 cc. pipette, 150 to 300 cc. of distilled water depending upon the nature and amount of soil employed, the water being applied either pure or modified as indicated under the individual experiments. It was planned to have approximately 30 per cent of moisture present initially in all experiments, thus affording ample moisture for vigorous bacterial multiplication. . . . In all cases the total initial weight was recorded and subsequent weighings were then made at more or less frequent intervals to determine the rate of evaporation. . . . The results of the individual dishes of each set were then added and the average taken to indicate the loss due to evaporation occurring from period to period."

A study was made by this method of the evaporation from untreated soil and from that sterilized with mercuric chlorid. Although the results were variable with individual plates, they were uniformly and considerably higher in the inoculated plates than in the sterile plates.

"One finds the maximum interval variation between sterile and normal sets in the greenhouse and the field clay soils, and the least variation with the sandy soil. On total variations the greenhouse soil exceeds all others, showing as a maximum 19.02 gm. difference in favor of the inoculated set. It is interesting to note that in all cases the rate of evaporation was more rapid in the inoculated set than in the sterile set."

A study of the relation of bacterial multiplication to evaporation apparently indicated that the bacterial activities were responsible for the increased rate of evaporation in the normal or inoculated series. Remoistening the partly dried plates increased the rate of evaporation in the inoculated soils over that initially observed. The addition of 1 per cent blood meal increased evaporation from inoculated soil over sterile soil, but addition of 1 per cent barnyard manure decreased the difference.

"The results here obtained seemingly contradict all previous work, for in the series receiving manurial additions the sterile plates exceed the normal or inoculated ones in the rate of evaporation. This is true in both cases where manure was added. It is noteworthy, however, that the untreated series showed an acceleration in the rate of evaporation in the inoculated plates which harmonizes with the results of previous work."

Addition of 2 per cent meal produced less effect than 1 per cent and addition of 2 per cent manure reduced the evaporation due to bacterial activity.

By means of a series of percolator tests there was found to be increased capillary rise of moisture in the inoculated soil. It was also shown that evaporation was increased by the gas formation due to bacterial activity in the inoculated soil.

The results of tests with soils inoculated with pure cultures of Azotobacter and *Bacillus subtilis* confirmed those with soils containing mixed cultures.

The general conclusion is "that the soil bacteria and their activities are factors which must be considered when discussing the movement of soil water; not so much because of the cells themselves as because of the by-products which they form and the subsequent influence of the same upon such factors as surface tension, capillarity, viscosity, etc., of the soil moisture. The biological feature of the soil apparently forms an important contributory factor in determining the movement of soil water."

The nitrogen cycle in the soil, E. J. RUSSELL (*Chem. World, 1 (1912), No. 6, pp. 185–187, fig. 1*).—In this article the position is taken that most of the reactions of the nitrogen cycle of the soil are bacterial.

Studies in soil bacteriology.—V, The nitrifying and ammonifying powers of North Carolina soils, F. L. STEVENS, W. A. WINTERS, ET AL. (*Centbl. Bakt. [etc.], 2. Abt., 34 (1912), No. 8–9, pp. 187–203, figs. 13*).—In continuation of previous studies (E. S. R., 23, p. 721), tests were made of the nitrifying and ammonifying power of samples of typical soils from different parts of the State. An attempt is made to correlate the results with the crop-producing power of the soils.

About 42 per cent of the soils showed no nitrification. It was as a rule more active in soils which had grown legumes or had been manured than on soils not so treated. No positive relation between nitrification and productiveness was established. Ammonification was very variable.

A summary of investigations on nitrogen fixation of Azotobacter chrococcum, G. RÖSING (*Centbl. Bakt. [etc.], 2. Abt., 33 (1912), No. 25, pp. 618–623*).—The work of T. Remy and the author on this subject is summarized.

The results of the investigations, which have been in large part reported and noted from time to time, show that lime and magnesia increased the amount of nitrogen fixed in Beijerinck's mannit solution by Azotobacter. Free acid, which prevented any marked bacterial development, was neutralized by lime or magnesia, thus enabling the organisms to utilize the carbohydrates added as sources of energy. Mannit, sucrose, and dextrose in connection with mannit, were especially favorable as such sources of energy. The gain in nitrogen during a period of 6 weeks from additions of sucrose (2 per cent) was 103 mg. per kilogram of soil. Tests showed that the nitrogen thus fixed in the soil was a useful source of supply of this constituent to the higher plants. About 32 per cent of nitrogen fixed in the soil was assimilated.

Humus acids increased the fixation of nitrogen in nutritive solutions, the maximum amount being produced for 0.1 gm. of humus acid per gram of Beijerinck's mannit solution. The active constituent of the humus acid was found to be iron. A solution of 1 gm. iron chlorid, 10 gm. cane sugar, and 0.8 gm. of sodium per liter was especially beneficial to the bacterial activity.

The amount of nitrogen fixed per gram of Beijerinck's mannit solution was increased from 2.23 mg. to 10.3 mg. by addition of the iron solution. The form of the iron was also found to have an important influence, there being a much greater fixation of nitrogen with applications of iron in form of Thomas phosphate and of iron silicate, than with equal applications in the form of other compounds of organic as well as of inorganic character. The beneficial effect increased with the larger amounts of iron.

The author states that although the exact nature of the action of the iron has not been definitely determined, it would seem that the main process is one in which the iron acts as a catalytic agent, changing the nitrogen of the air to nitrite. In this form it is taken up by the bacteria, whereupon new nitrite is formed, the process going on continually.

The influence of stall manure upon the bacterial flora of the soil, J. C. TEMPLE (*Centbl. Bakt. [etc.], 2. Abt., 34 (1912), No. 8–9, pp. 204–223*).—These investigations have already been noted from another source (E. S. R., 26, p. 31).

Earthworms and the fertility of the soil, C. BEAUGÉ (*Jour. Agr. Prat., n. ser., 23 (1912), No. 16, pp. 506, 507*).—Investigations carried on by the British Government in the valley of the White Nile in the Sudan indicate that the great fertility of the soil of this valley is due in large part to the work of earthworms. Observations are recorded from which it is estimated that the castings of earthworms on these soils during the 6 months of the most active growing season of the year amounts to 239,580 lbs. per acre. The author reports similar observations in Upper Egypt from which it is estimated that the castings in this region amount to 58,785 lbs. during the 6 months.

[Maintenance of soil fertility in China, Korea, and Japan], F. H. KING (In *Farmers of Forty Centuries. Madison, Wis., 1911, pp. IX+441, pl. 1, figs. 248*).—The results are here given of a study of the agricultural methods and practices of these countries, particularly of the intensive methods of soil management, developed by a people who with almost no fertilizer resources except those of the farm, the home, and the town, have maintained the productiveness of fields for more than 3,000 years, supporting a population of nearly 500,000,000 people upon an area smaller than the improved farm lands of the United States. The secret of this success is shown to be utilization of the products of the soil so that there shall be no waste of fertility.

"Almost every foot of land is made to contribute material for food, fuel, or fabric. Everything which can be made edible serves as food for man or domestic animals. Whatever can not be eaten or worn is used for fuel. The wastes of the body, of fuel, and of fabric worn beyond other use are taken back to the field; before doing so they are housed against waste from weather, compounded with intelligence and forethought, and patiently labored with through one, three, or even six months, to bring them into the most efficient form to serve as manure for the soil or as feed for the crop."

In Japan there were in 1907 "some 5,814,362 households of farmers tilling 15,201,969 acres and feeding 3,522,877 additional households, or 51,742,398 people. This is an average of 3.4 people to the acre of cultivated land, each farmer's household tilling an average of 2.6 acres. The lands yet to be reclaimed are being put under cultivation rapidly, the amount improved in 1907 being 64,448 acres. If the new lands to be reclaimed can be made as productive as those now in use there should be opportunity for an increase in population to the extent of about 35,000,000 without changing the present ratio of 3.4 people to the acre of cultivated land."

In the author's opinion, the agriculture of the newer nations would be greatly benefited by a careful consideration of the intensive methods of these countries.

"When we reflect upon the depleted fertility of our own older farm lands, comparatively few of which have seen a century's service, and upon the enormous quantity of mineral fertilizers which are being applied annually to them in order to secure paying yields, it becomes evident that the time is here when profound consideration should be given to the practices the Mongolian race has maintained through many centuries, which permit it to be said of China that one-sixth of an acre of good land is ample for the maintenance of one person, and which are feeding an average of three people per acre of farm land in the three southernmost of the four main islands of Japan."

How may fertilizer experiments be improved? A. W. K. de Jong (*Teysmannia, 22 (1911), Nos. 6, pp. 349–362; 7, pp. 425–441; 9–10, pp. 562–574; 11, pp. 675–701, pl. 1, figs. 4; 23 (1912), Nos. 3, pp. 135–175, figs. 11; 5, pp. 297–307*).—This is mainly a summary of the more important information contained in previous articles on the same subject by Wagner, A. Mayer, Wohltmann, Drechsler, Fleischer, Liebscher, Dafert, Mitscherlich, Holtsmark and Larsen, H. M. Gmelin, Middleton, Wood and Stratton, and Mercer and Hall (E. S. R., 15, p. 130; 16, p. 658; 17, p. 963; 18, p. 436; 19, p. 531; 22, p. 223; 24, p. 633; 25, p. 825; 26, p. 732). The article is a very complete review of recommendations which have been made by various investigators for the improvement of the accuracy of field experiments with fertilizers.

On the discrepancy between the results obtained by experiments in manuring, etc., in pots and in the field, L. Cohen (*Jour. and Proc. Roy. Soc. N. S. Wales, 43 (1909), pt. 2, pp. 117–122; abs. in Chem. Abs., 6 (1912), No. 10, p. 1332*).—It is suggested that the discrepancies may be due to variations in concentration of the soil solution. "There is undoubted evidence that in ordinary soil of medium fertility the use of soluble fertilizers is without profit, in fact in certain cases positively detrimental, unless a correspondingly large amount of water is used on the growing crop, so as to bring the soil moisture below the maximum limit of concentration during its growth." The importance of exact studies along this line is pointed out.

Loss of fertilizer constituents in drainage water, A. W. Blair (*Proc. Fla. State Hort. Soc., 24 (1911), pp. 105–111, pl. 1, fig. 1*).—The tanks installed at the Florida Station for the study of this subject (E. S. R., 25, p. 117) are described and some of the preliminary results obtained with them are reported.

Experiments with sodium nitrate, calcium nitrate, and calcium cyanamid on moor soils, A. Rindell (*Meddel. Finska Mosskulturför. Försöksv., 3 (1911), pp. 22; abs. in Zentbl. Agr. Chem., 41 (1912), No. 5, pp. 317–321*).—In these experiments, on Finnish moor soils in need of nitrogen, barnyard manure was found to be more effective than sodium nitrate. The relative efficiency of sodium nitrate, calcium nitrate, and calcium carbonate varied with the amount of the application and the character of the soil.

The present status of the artificial nitrogen fertilizer industry, F. W. Dafert (*Österr. Chem. Ztg., 15 (1912), No. 7, pp. 86–89*).—The present status of the manufacture of ammonium sulphate, nitric acid, lime nitrogen, nitrids, and the like, is briefly reviewed.

The nitrate of soda industry of Chile, B. Diaz-Ossa (*Rev. Gén. Sci., 23 (1912), No. 10, pp. 389–396, figs. 8; Sci. Amer. Sup., 74 (1912), No. 1910, pp. 82, 83, figs. 8*).—This article, by the professor of nitrate of soda technology of the University of Chile, discusses briefly the history of development of the industry, the location and character of the deposits, and methods of exploitation and purification of the nitrate.

The author is of the opinion that there is now enough nitrate in sight to supply the actual demand for a century. The complex character of the salts is pointed out. They contain besides sodium nitrate, chlorid, and sulphate, potas-

sium chlorid, calcium sulphate and nitrate, magnesium chlorid, sulphate, and nitrate, sodium iodate, sodium nitrosulphate (darapskite), calcium iodate (lautarite), and calcium iodochromate (dietzeite). The soils of the region are stated to be highly radioactive.

New methods in the ammonia industry, V. HÖLBLING (*Osterr. Chem. Ztg., 15 (1912), No. 9, pp. 114–118, figs. 5; Engrais, 27 (1912), No. 41, pp. 1133–1137*).—Recently proposed methods of manufacturing ammonia are briefly described.

[Nitrogenous fertilizers derived from the air] (*9. Cong. Internat. Agr. Madrid, 1911, pp. 762–844*).—The fertilizer section of the Ninth International Congress of Agriculture at Madrid was devoted exclusively to the consideration of papers on nitrogenous fertilizers obtained from the air as follows: Study and Application of New Fertilizers Prepared from the Nitrogen of the Air, by E. Noriega Abascal; Nitrogenous Fertilizers and Calcium Cyanamid, by L. Rebello da Silva; Study of the New Fertilizers Prepared from the Nitrogen of the Air, by C. Schreiber; Importance of Synthetic Nitrogenous Fertilizers in Agriculture, by M. Weitz; Nitrogenous Fertilizers Derived from the Air, by J. Úbeda Correal; and Cyanamid, by C. Pluvinage.

These papers set forth quite fully the present status of the manufacture and use of nitrogenous fertilizers derived from the air from the agricultural standpoint.

The conclusions of the congress were generally favorable to the use of these fertilizers under conditions and precautions which are carefully defined.

The toxic action of organic compounds as modified by fertilizer salts, O. SCHREINER and J. J. SKINNER (*Bot. Gaz., 54 (1912), No. 1, pp. 31–48, figs. 5; Science, n. ser., 33 (1911), No. 844, p. 340; Chem. Abs., 6 (1912), No. 9, p. 1196*).—"The action of fertilizer salts in restraining the harmful influence of certain organic compounds was studied, as well as the effect of the compounds on absorption. The culture solutions comprised all possible ratios of the three principal fertilizer elements, phosphate, nitrate, and potassium, varying in 10 per cent stages. . . .

"The cumarin depressed potash and nitrate removal from nutrient solution more than phosphate; the quinone, on the other hand, depressed phosphate and nitrate more than potash; the effect of vanillin was not determined in this regard. It is interesting to mention that dihydroxystearic acid, which, as previously reported, appears to act much as vanillin did, depressed phosphate and potash more than nitrate. In this respect again the influence of the various harmful substances was different.

"The conclusion is drawn that different toxic substances produce definite effects in their action on plants and that the effects are modified differently by the different fertilizer salts."

See also a previous note (E. S. R., 26, p. 224).

The effect of the "wet process" on the availability of low-grade nitrogenous materials, B. L. HARTWELL and F. R. PEMBER (*Jour. Indus. and Engin. Chem., 4 (1912), No. 6, pp. 441–443*).—An abstract of this paper has been noted (E. S. R., 26, p. 725).

Relation of active potash to pot experiments, G. S. FRAPS (*Jour. Indus. and Engin. Chem., 4 (1912), No. 7, pp. 525, 526*).—This is a summary of experiments reported in full in Bulletin 145 of the Texas Station (E. S. R., 27, p. 323).

Mica as a source of potash for plants, E. BLANCK (*Jour. Landw., 60 (1912), No. 2, pp. 97–110; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 597, II, p. 677; Ztschr. Angew. Chem., 25 (1912), No. 40, p. 2085*).—Pot experiments in which muscovite and biotite were used as sources of potash supply to oats are reported, the results showing that the potash of muscovite was much less readily available than that of biotite, but was assimilated by the plant much more

readily than the potash of feldspar. From 10.37 to 14.67 per cent of the potash of biotite was assimilated, as compared with from 1.66 to 2.86 per cent of the potash of the muscovite.

Preparation of superphosphate with sulphur dioxid and chlorin, Q. SESTINI (*Indus. Chim., 12 (1912), pp. 49–53; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 6, p. 293*).—Experiments are reported which showed that it is possible to prepare superphosphate by the combined action of sulphur dioxid and chlorin on crude mineral phosphate according to the following equation:

$$Ca_3(PO_4)_2+2SO_2+4H_2O+2Cl_2=Ca(H_2PO_4)_2+2CaSO_4+4HCl.$$

Guano supply of French Somaliland, W. A. SCHULZ (*Daily Cons. and Trade Rpts. [U. S.], 15 (1912), No. 162, p. 189*).—It is stated that the abundant supplies of guano on the numerous small islands along the coast of French and Italian possessions in the Red Sea are beginning to be exploited, recent shipments having been made to Antwerp and Suez through the port of Jibuti. The guano is stated to be of high quality.

Fertilizer from city refuse (*Municipal Jour. and Engin., 30 (1911), Nos. 19, p. 678, figs. 2; 26, p. 918*).—A machine which has been in operation at Southwark, England, for grinding garbage and preparing a fertilizer suitable for use on stiff clay soils is described.

The utilization of sewage sludge (*Engin. Rec., 65 (1912), No. 26, pp. 701, 702*).—The practicability of the use of sewage sludge as fertilizer is questioned, as is also the economy of extracting grease from the material, although the latter process increases the value of the sludge for fertilizing purposes. The authorities cited are G. W. Fuller (E. S. R., 27, p. 212) and W. Naylor (E. S. R., 27, p. 318).

Annual report on fertilizers August 1, 1911, B. B. Ross (*Ann. Rpt. Ala. Dept. Agr. and Indus., 1911, pp. 163–316*).—Analyses and valuations of fertilizers inspected in Alabama are reported, with the text of the state fertilizer laws and a brief discussion of the nature and use of fertilizers.

Analyses of commercial fertilizers, M. A. SCOVELL and H. E. CURTIS (*Kentucky Sta. Bul. 158, pp. 197–328*).—This bulletin reports analyses and valuations of fertilizers inspected by the Kentucky Station during 1911. The results show "that in most cases the samples analyzed have come fully up to the guaranty or, where there is a slight deficiency in one ingredient, it has been made up by an excess in one or both of the other ingredients."

Russian fertilizer situation (*Amer. Fert., 37 (1912), No. 1, pp. 38, 39*).—Figures are given which show that the amount of fertilizer used in Russia nearly trebled in the 5 years 1907 to 1911, being in the latter year 360,000 short tons. The use of fertilizers in the Empire is, however, still comparatively small. The fertilizers used are practically all imported, although considerable quantities of bones, fish waste, slaughterhouse by-products, and similar materials are exported. Large deposits of phosphates are available.

AGRICULTURAL BOTANY.

Chemical effects of radiant energy in plant processes, H. A. SPOEHR (*Carnegie Inst. Washington Year Book, 10 (1911), p. 65*).—Experiments in photochemical reactions supposedly similar to those occurring in plants have been carried out.

It was found that aqueous solutions of potassium and calcium nitrates are reduced by means of ultraviolet light, sunlight, and diffused light to the corresponding nitrites and ammonia, with the liberation of oxygen and the production of alkalinity in the solution. It is claimed that Schimper has shown that the disappearance of nitrates in the leaf takes place in the sunlight. If, there-

fore, the above reaction takes place in the leaf, not only would the proper conditions for carbohydrate synthesis be established, but the nitrogen would also be produced in the best form and the most available place for protein synthesis.

The rôle of organic acids in the plant leaf and the relation of these substances to protein synthesis are under investigation. It has been found that the hydroxy-acids, under the influence of ultraviolet light, are decomposed, yielding carbon dioxid and aldehyde-like substances. These are believed to be necessary in the further synthesis of compounds of importance to the organisms.

Rhythm in plant development, G. KLEBS (*Sitzber. Heidelb. Akad. Wiss., Math. Naturw. Kl., 2 B (1911), Abhandl. 23, pp. 84; abs. in Bot. Centbl., 119 (1912), No. 17, p. 426*).—Continuing previous work by the author (E. S. R., 24, p. 141), an account is given of studies made on 40 living European plants taken from their native environment to Java and there observed under control conditions, in order to ascertain whether or not the tendency to vary between periods of alternate growth and rest is inherent or dependent upon external conditions.

It was found that the most of these plants showed continued growth in the new situation during the time when in Europe they would be at rest, but that a somewhat marked resting period could be induced by lowering such life conditions as temperature, moisture, nutrition, etc. This and further facts observed led the investigator to advise caution in accepting the theory that an inner periodicity exists, and to favor the view that periodicity depends very largely upon climatic and nutritive conditions.

A bibliography is appended.

Transpiration in succulent plants, Miss E. M. DELF (*Ann. Bot. [London], 26 (1912), No. 102, pp. 409–442, fig. 1*).—The author has made a study of transpiration in relation to the structure and habitat of succulent plants, particular attention being given to the transpiring surface and water storing and conducting systems.

It was found that the chief structural peculiarities of succulent plants are connected with the transpiring surface and the storage of water. Summing up the characteristics of the transpiring surface, the author found that succulent plants show a varying amount of reduction in the leaf surface, and that this may or may not be accompanied by arrangements which tend to diminish transpiration. Most succulent plants are characterized by the possession of definite aqueous tissue; others have a great development of mesophyll in the leaves, and then the innermost layers tend to function as storage cells for water.

The author states that the peculiarities of succulent plants must be regarded as adaptations to environment of real importance to the plant. They may be produced during the lifetime of the individual, as in the development of additional mesophyll or storage tissue in a facultative halophyte, or they may appear as permanent characteristics, as in the case of plants that are found exclusively in saline situations.

The water relations of halophytes and sclerophylls, F. E. LLOYD (*Carnegie Inst. Washington Year Book, 10 (1911), pp. 61, 62*).—The author gives a brief summary of investigations to determine the absolute, relative, and cuticular transpiration of a number of beach plants and of trees and shrubs from neighboring slopes. A method was devised for observing the actual condition of stomata on living leaves, and from the investigations tentative conclusions were reached as follows:

"(1) Little variation in the actual amount of water in the leaves was observed, and the rate of loss was low in the cool air and high humidities of the Carmel region in which the work was performed.

"(2) The beach plants or halophytes showed a lively stomatal activity—a remarkable readiness to wilt and desiccate. In this particular such plants are widely different from the fleshy plants of the desert.

"(3) The osmotic pressures of the thick leaves of beach plants are equivalent to 0.2 to 1.3 potassium nitrate, or 7.5 to 48 atmospheres. The pressure in the roots is notably lower, as in other plants.

"(4) The amount of water vapor which any of these plants may absorb from the air is small and of little significance in the life of the plant."

The influence of methylene blue on the respiration of plants, W. PALLADIN, ELISE HÜBBENET, and MARIE KORSAKOW (*Biochem. Ztschr., 35 (1911), No. 1–2, pp. 1–17, fig. 1; abs. in Jour. Chem. Soc. [London], 100 (1911), No. 588, II, pp. 919, 920; Bot. Centbl., 119 (1912), No. 17, pp. 427, 428*).—This contains investigations made by W. Palladin, partly in connection with others, on the respiration of living and killed plants (E. S. R., 23, p. 629; 25, pp. 123, 411; 27, p. 426), the principal findings now reported being as follows:

With access of air the respiration with etiolated tips of *Vicia faba*, colored with methylene blue, is increased by from 65 to 107 per cent; while that of *Pisum sativum* is increased from 11 to 18 per cent. The action of quinin is, in general, similar to this; but, while the respiration of seeds of *V. faba* is increased by methylene blue, that of seeds of *P. sativum* is diminished. The differences observed are ascribed to the larger amounts of respiratory chromogen contained in the objects most affected, and to the alleged fact that, where little of such chromogen is present, quinin usually shows a poisonous action. Killing *V. faba* by means of cold stops the stimulating action of the methylene blue. The anaerobic respiration of stem tips of *V. faba* and *P. sativum*, stimulated with methylene blue, is progressively checked. It appears as if in absence of oxygen the cells are not able to protect themselves from the influence of the methylene blue, which then tends to act as a poison. Other differences between the action of the methylene blue on aerobic and anaerobic respiration are demonstrated. The ratio of anaerobic carbon dioxid separation to alcohol production is about 1:1 for colored seeds, while for the control seeds it is smaller. Disodium hydrogen phosphate paralyzes the injurious action of methylene blue on etiolated tips of *V. faba*.

The influence of methylene blue on the respiration of plants, ELISE HÜBBENET (*Trudy Imp. S. Peterb. Obshch. Estestvo. (Trav. Soc. Imp. Nat. St. Petersb.), 42 (1911), I, No. 7–8, pp. 279–292, 308, 309*).—The substance of this article has been given in the above article.

The freezing of plants, H. MOLISCH (*Schr. Ver. Naturw. Kenntnisse Wien, 51 (1910–11), pp. 141–176, figs. 7; abs. in Bot. Centbl., 119 (1912), No. 16, pp. 404, 405*).—An account is given of numerous freezing experiments with various higher and lower plants, with amœbæ, and with other objects.

Emphasis is laid on the extraction of cytoplasm in the freezing process, following which the protoplasm is seen to be shriveled into a shapeless mass or into a network with water outside or occupying the interstices. According to the author, any of 3 forms may result from freezing, depending upon whether ice forms inside the cell, outside the cytoplasm, or in both these situations. It is claimed as regards the survival of the plant it matters little as a rule whether it be thawed out quickly or slowly. The resistance offered by some plants to cold is thought to depend upon the constitution of the plasma.

A short bibliography is appended.

Some effects of severe frosts upon vegetation in a condition of active growth, F. K. BUTTERS and C. O. ROSENDAHL (*Minn. Bot. Studies, 4 (1911), pt. 2, pp. 153–159, pl. 1*).—This is a detailed account of investigations, a pre-

liminary notice of which has been given elsewhere (E. S. R., 25, p. 128), and summarized as follows:

"(1) Prolonged solid freezing will injure many plants and parts of plants which are not hurt by 2.5° (C.) of frost. (2) Mechanical damage from loss of turgidity and brittleness of frozen members is great. (3) Hard freezing is far more destructive to our native woody plants than to our herbaceous vegetation. (4) Woody plants recover from hard freezing very slowly and produce very abnormal growth for the season in which it occurs."

Chemical protection of plants against freezing, N. A. MAKSIMOV (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 13 (1912), No. 1, pp. 1–26*).—This is in substance the same as a report previously noted (E. S. R., 27, p. 333). A more extended report with the more general conclusions reached is promised.

Germination of seed as affected by sulphuric acid treatment, H. H. LOVE and C. E. LEIGHTY (*New York Cornell Sta. Bul. 312, pp. 293–336, figs. 9*).—The results are given of a study of the effect of sulphuric acid to hasten the germination of hard leguminous seed. Concentrated acid, with a specific gravity of about 1.84, was used, and seeds of red, white, alsike, sweet, and Japan clover, alfalfa, several weeds, and cotton were subjected to the influence of the acid for various periods of time.

The authors found that increased germination was secured by treating all the seeds with concentrated sulphuric acid. The effect of the treatment was still apparent after the seed had been allowed to dry before germination. Many varieties of weed seeds commonly found in samples of clover or alfalfa seeds were killed by the acid treatment, while the germination of others was either benefited or not at all affected. Cotton seed was easily delinted upon treatment, and the germination increased and hastened.

The method of treatment for different quantities of seed is described and consists essentially of subjecting the seed to sulphuric acid for from 15 to 45 minutes at ordinary room temperature, after which the seed is thoroughly washed. It may or may not be allowed to dry before planting.

The influence of the seed upon the size of the fruit in Staphylea, II, J. A. HARRIS (*Bot. Gaz., 53 (1912), No. 5, pp. 396–414, fig. 1*).—In continuation of work previously noted (E. S. R., 27, p. 231) new data were obtained by the author, the conclusions from which may, in the main, be summarized as follows:

There is a very substantial interdependence between the number of seeds and the fruit length of Staphylea, higher than that between the number per locule and length, and in large measure independent of the influence of the number of ovules. Mechanical stretching by pressure of adjacent seeds as a factor seems to be excluded. In general, the facts observed are thought to warrant the conclusion that the interdependence between the number of seeds and the length of fruit in Staphylea is a direct physiological one and that the two characters stand in some degree in the relationship to each other of cause and effect.

Some points in the morphology and physiology of fasciated seedlings, T. REED (*Ann. Bot. [London], 26 (1912), No. 102, pp. 389–402, figs. 9*).—Investigations on the seedling plants of various species of Leguminosæ were carried on to determine some of the facts relating to fasciation. The seeds were germinated in soil, and when the plumular shoots had developed about an inch or so the apical bud was cut away and the seedlings allowed to resume their growth.

Two types of seedlings were used, the hypogeal and the epigeal types, but fasciations were induced only in the former class. The hypocotyl of hypogeal seedlings was found to become fasciated as the result of adherence of a number of fasciated shoots. The food reserves in the two types of seedlings may be similar chemically, but the availability of the food differs. Hypogeal seedlings

are said to be remarkably dependent on their cotyledonary food reserves for their early development as contrasted with seedlings of the epigeal type.

The transformation of reserve substance in tubers of Dahlia variabilis, N. SCIACCA and G. ZERILLI (*Ann. R. Scuola Sup. Agr. Portici, 2. scr., 9 (1909), Art. 4, pp. 1–23*).—In the respiration of dahlia tubers it was found that they consumed as much as 2.47 per cent of their total weight in 70 days; also the ordinarily insoluble material of the tubers was sensibly drawn upon. Respiration, which is most active when the tubers have given up about 30 per cent of their contained water, is slowest when the tubers are in a rarified atmosphere. In this situation, moreover, the insoluble material appears to take no part in respiration. The noninulin contents remain sensibly constant. The substances given off appear mainly as respiration products.

As the time for budding approaches, the inulin begins to pass into the more soluble forms of inuloid and levulose. The mobilization of inulin occurs in all parts of the tuber, but more particularly in the central cylinder which corresponds to the course of the fibrovascular bundles and which is in more direct relation to the young shoots. It appears from the experiments that the gradual hydrolyzing of the inulin is accompanied by a current of mobilization, the reserve material being transferred as it becomes soluble from the periphery toward the center.

Displacement by water of nutritive substances in plants, G. ANDRÉ (*Compt. Rend. Acad. Sci. [Paris], 152 (1911), No. 26, pp. 1857–1860; 153 (1911), Nos. 24, pp. 1234–1236; 26, pp. 1497–1500; 154 (1912), No. 17, pp. 1103–1105*).—Continuing previous work (E. S. R., 25, p. 432), the author gives in a series of notes the detailed results obtained from a study of the distribution and diffusion of certain soluble substances in vegetable organs, also from his studies of the displacement of such substances by water in certain plants.

The significance of protein assimilation in the life processes of plants, F. EHRLICH (*Samml. Chem. u. Chem. Tech. Vorträge, 17 (1912), pp. 297–310*).—A brief discussion is given of the progress of research and of the present state of knowledge in this connection.

The building of protein by yeasts and mold fungi, F. EHRLICH (*Biochem. Ztschr., 36 (1911), No. 5–6, pp. 477–497; abs. in Mycol. Centbl., 1 (1912), No. 2, pp. 52, 53*).—A preliminary report is made on a series of investigations with *Willia anomala* and several mildew fungi.

It is stated that *W. anomala* is able to utilize besides sugar a number of relatively very simple organic substances, such as glycerin, lactic acid, and methyl, ethyl, and amyl alcohols as sources of carbon and energy in order to form its protein from amino acids; also that tyrosol is formed from tyrosin as from sugar during the growth of yeast in the culture medium. The author concludes that tyrosin in the presence of other carbon sources experiences no such thoroughgoing utilization as when the yeast in question ferments sugar.

In the culture with methyl alcohol, formic acid appears; in that with ethyl alcohol, acetic acid; and in that with amyl alcohol, valeric acid is formed. It appears as if strongly oxidizing enzyms present in *W. anomala* enable this yeast to utilize substances like alcohols, etc., as carbon supply and energy source. Such enzyms appear to be absent from the culture yeasts. *Oidium lactis, Rhizopus nigricans*, and other mildew fungi are able, like the "wild yeast," to employ glycerin, lactic acid, and ethyl alcohol for building protein from amino acid solutions.

Carbon assimilation by plants as affected by organic acids and their potassium salts, RAVIN (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 17, pp. 1100–1103*).—From studies made on *Raphanus sativus* the author reports that malic, tartaric, citric, succinic, and oxalic acids, the organic acids most com-

monly met with in green plants, as well as their potassium salts, are absorbed by the root system of the radish and are assimilated; also that these acids are more nutritive than their acid potassium salts, and that these salts exceed in this respect the corresponding neutral salts.

The formation of saccharose in sugar beets, F. Strohmer, H. Briem, and O. Fallada (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 40 (1911), No. 6, pp. 857–866*).—The authors investigated sugar beets at the time of flowering and on ripening of seeds in regard to sugar content, etc., reaching the conclusion that sugar beets of the second year's growth are able to form sugar for storing purposes in their assimilating organs, not only in the stems but also in the roots.

A bibliography is appended.

The rôle of catalase in plants, W. Zaleski and Anna Rosenberg (*Biochem. Ztschr., 33 (1911), No. 1–3, pp. 1–15; abs. in Bot. Centbl., 119 (1912), No. 17, p. 431*).—The authors report, as the result of their investigations, that the activity of catalase is considerably weakened by its extraction with ether or with ethyl or methyl alcohols, also in varying degrees by use of several other substances named. They seem to hold to the view that a relation exists between the activity of catalase and that of the oxidation process.

Comparison of the total nitrogen and nitric nitrogen in parasitic and saprophytic plants, L. Lutz (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 19, pp. 1247–1249; Bul. Soc. Bot. France, 59 (1912), No. 4–5, pp. 370–373*).—Studies were made of a number of phanerogamic absolute parasites, hemiparasites, and saprophytes with and without chlorophyll to determine the nitric nitrogen and total nitrogen which they contain.

As a result of the studies the author claims that absolute parasites, particularly those containing chlorophyll, are in general poorer in total nitrogen than the hemiparasites whose roots are in soil from which they can obtain nutritive material. The differences in nitric nitrogen are less marked. In general, plants containing chlorophyll are lower in nitric nitrogen as the percentage of total nitrogen increases, while with plants not containing chlorophyll the contrary was observed. The author claims that the figures presented indicate the important action of chlorophyll on the accumulation and assimilation of nitrogen by parasitic plants.

The relation of some fungi to organic acids, R. O. Herzog, O. Ripke, and O. Saladin (*Hoppe-Seyler's Ztschr. Physiol. Chem., 73 (1911), No. 3–4, pp. 284–307, figs. 3; abs. in Jour. Chem. Soc. [London], 100 (1911), No. 588, II, p. 915*).—In a series of papers by these authors accounts are given of the behavior of a number of mold fungi as affected by various organic acids. The fungi were cultivated in Uschinsky's nutrient medium, to which the different acids were added in amounts varying from 0.5 to 3 per cent.

When the molds were grown in these solutions for 6 weeks, they caused from 30 to 95 per cent of the acid to disappear, the different species of fungi transforming the acids in different amounts. Mycelium killed with acetone and ether and kept under water through which air was passed developed more carbon dioxid in the presence of acids, the acids being used up in the process.

In the second paper experiments with *Mycoderma cervisiæ* are reported. This fungus killed by acetone and kept in solution of acetic or lactic acids caused a disappearance of the acid, which was not oxidized. Mandelic acid behaved in a similar manner, being chemically changed. Living fungi gave similar results with acids.

In the last paper the effect of amino acids on *Penicillium glaucum* is described, in which it is shown that the addition of leucin to a culture of the mycelium of the fungus caused a definite increase in the daily production of

carbon dioxid. The increase amounted to considerably more than could be accounted for by the leucin that had disappeared.

Studies on iron-storing Hyphomycetes, R. LIESKE (*Jahrb. Wiss. Bot. [Pringsheim], 50 (1911), No. 3, pp. 328–354, figs. 3; abs. in Mycol. Centbl., 1 (1912), No. 1, p. 20*).—The author was led by numerous observations on the rapid growth of certain fungi and bacteria in iron solutions to undertake a study of certain forms, in particular of one closely allied morphologically with *Citromyces pfefferianus* but showing such physiological divergences as led to its classification as a separate species to which he gave the name *C. siderophilus*. This was investigated in regard to its behavior in connection with iron solutions added to its culture medium, as were also the fungi *Aspergillus niger*, *Penicillium glaucum*, *C. glaber*, *C. pfefferianus*, and several iron bacteria.

Numerous fungi living in iron-containing waters are found to store in their cells, as do the iron bacteria, a considerable amount of hydrated oxid of iron. Most of these are closely allied morphologically with *C. pfefferianus*, but physiologically they differ widely therefrom. *C. siderophilus* thrives in an iron-free culture medium as do the mold fungi, but the addition of 0.5 per cent sulphate of iron causes a notable increase of weight in case of this fungus, while other mold fungi are checked in growth by such addition. *C. siderophilus* shows a particular resistance to the poisonous influence of zinc sulphate. Iron protoxid salts cause no chemically poisonous effect on *C. siderophilus* but a significant promotion of growth. Iron oxid salts are as poisonous to this as to the other fungi. The growth-promoting agent is the ferro-ion, the growth-checking one the ferri-ion. Nondissociating iron salts have no marked influence on growth.

With the presence of iron protoxid in the nutritive solution, the fungus is better able to utilize its carbon supply and can thus flourish in a poorer culture medium. The incrustation of hyphæ with iron is not dependent upon the growth-producing influence of the protoxid, but upon the nature or constitution of the carbon source. It is supposed that the iron-storing bacteria play an essential part in the formation of beds of bog-iron ore.

On the presence of arbutin in leaves of Grevillea robusta, E. BOURQUELOT and Mlle. A. FICHTENHOLZ (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 17, pp. 1106–1108*).—Since their discovery and investigation of arbutin in species of Pyrus (E. S. R., 25, p. 27; 26, p. 327), the authors have extended their studies to other genera and they state that they have been able to identify this glucosid in leaves of *G. robusta*.

Wood coloring in living spruce, C. VON TUBEUF (*Naturw. Ztschr. Forst u. Landw., 9 (1911), No. 6, pp. 273–276, figs. 2; abs. in Bot. Centbl., 119 (1912), No. 5, p. 98*).—An account is given of the author's studies on 3 specimens of spruce, in which the sapwood from roots to topmost twigs, with the exception of the youngest annual rings, showed a blue-black color on being freshly cut, becoming darker for a few days and afterwards remaining unchanged. Microscopic investigations failed to reveal the presence of any organism or any indication of other abnormality. Microchemical tests seemed to show that the coloring was due to impregnation with tannate of iron. This, however, did not seem to interfere with the free passage of water, etc. Root injuries, it is thought, may be a contributing cause. Further investigations are contemplated to induce artificially, if possible, coloration, which appears to be entirely harmless to the living wood.

The influence of sea water on the distribution of plants, J. W. HARSHBERGER (*Proc. Amer. Phil. Soc., 50 (1911), No. 201, pp. 457–496, pls. 3, figs. 7*).—A study was made of the salt content of marsh soils and estuarine waters in their relation to plant distribution along the coast of New Jersey. The hy-

drometer was found very efficient in this respect, and the tolerance to salt of a large number of plants was determined.

As a result of his investigations the author concludes that the salinity of the water, which can be determined by the hydrometer, is the determining factor in the distribution of salt marsh plants, although the texture of the soil, its aeration, and the lines of marsh drainage are influential factors. The author further states that the method applied is also adapted to the study of alkali soils, especially in the western States, and that the farmer can test the presence or absence of salts and their relative amounts in the soil by this method.

Minnesota plant studies. IV, Minnesota mushrooms, F. E. CLEMENTS (*Minneapolis, Minn.: Geol. and Nat. Hist. Survey, 1910, pp. 169, pls. 3, figs. 123*).—This publication is designed for plant lovers and for classes in botany in high school and college. It gives simple and concise descriptions of different species of mushrooms occurring within the State.

Plant introduction for the plant breeder, D. FAIRCHILD (*U. S. Dept. Agr. Yearbook 1911, pp. 411–422, pls. 6, fig. 1*).—A popular account is given of the work of the Office of Foreign Seed and Plant Introduction of the Bureau of Plant Industry of this Department in securing species and varieties of plants from various parts of the world to be used by plant breeders in their efforts to obtain new combinations of characters that may prove of superior merit or adapted to special environmental conditions.

The present state of the mutation theory, L. BLARINGHEM (*Bul. Soc. Bot. France, 58 (1911), No. 8, pp. 644–652*).—The author briefly reviews the recent work of various investigators bearing upon the theory of mutation. In conclusion it is stated that the theory has not been impaired but rather strengthened by the more recent findings of these and related investigations.

Œnothera nanella, healthy and diseased, H. DE VRIES (*Science, n. ser., 35 (1912), No. 906, pp. 753, 754*).—Attention is called to the discovery of Zeijlstra regarding the presence of a bacterium in the tissues of dwarf *Œ. nanella* (E. S. R., 27, p. 30). Zeijlstra, however, found that under favorable conditions the side shoots of the dwarfs may become healthy and lose their abnormal characters.

The author carried on some experiments with this dwarf type of Œnothera in which plants were grown with a reduced amount of nitrogen and greater quantities of phosphate of calcium. The resulting plants showed all transitions between diseased and normal dwarfs, from which it is inferred that Zeijlstra's discovery instead of diminishing the value of *Œ. nanella* as a useful mutant has shown means of cultivating it in a healthy condition.

FIELD CROPS.

[Range improvement, plant introduction, and plant breeding], J. J. THORNBER, G. F. FREEMAN, and D. F. JONES (*Arizona Sta. Rpt. 1911, pp. 533–546*).—The conditions on the small and on the large range reserves during the past year are discussed. The last 2 seasons have been generally unfavorable to grazing interests. In this connection a report of progress is made on an experiment in the cutting of fence posts at different seasons.

In the introduction garden over 200 new plants were set out, and descriptions are given of the behavior of Rhodes grass (*Chloris gayana*), Japanese kudzu vine (*Pueraria thunbergeana*), and tamarisks (*Tamarix* spp.).

The work in plant breeding along agronomic and horticultural lines was confined to alfalfa, dates, beans, and sweet corn. During the year 29 new pedigree strains of alfalfa were tested. The yield and quality of hay of 2 strains were again well above the average.

The work with beans up to the present time has brought out the fact that 2 distinct types of these Indian esculent legumes are in existence. One type includes about 23 distinct varieties belonging to the ordinary kidney beans (*Phaseolus vulgaris*), while the other type known as the tepary (*P. acutifolius*) is specifically distinct from any cultivated bean heretofore mentioned in horticultural literature. More than 40 distinct agricultural varieties of the tepary bean were segregated and grown. In 9 experiments covering 3 years' work at Yuma, 2 years at Tucson, and 2 at McNeal, the average yield of the tepary variety was about 4 times the average for the varieties of the kidney beans. The adaptations of these beans to their environment are pointed out.

The relation between contemporaneous silking and tasseling of sweet corn varieties and their yield was pointed out by an experiment carried on during the season. Nineteen stalks having fresh silks and an abundance of pollen and 18 other equally vigorous stalks having the pollen ripe and in process of distribution but on which the silks had not yet appeared were tagged on August 29. When harvested the 19 ears from the stalks with contemporaneous tasseling and silking weighed on an average one and one-half times as much as the average for the ears from the other stalks.

[Work at the Sulphur Springs Valley and Snowflake dry farms], R. W. CLOTHIER and A. M. MCOMIE (*Arizona Sta. Rpt. 1911, pp. 529–532*).—Variety tests of corn at the Sulphur Springs Valley dry farm resulted in the best yield of grain from White Flint, 13.1 bu. per acre. Owing to an unfavorable season all yields were rather low, the highest being on a plat, a part of which received some flood water.

Four plats of tepary beans grown by purely dry-farming methods made an average yield of 527 lbs. per acre as compared with an average of 97 lbs. with common pink beans. The tepary beans displayed great resistance to drought as well as remarkable recuperative powers after the drought was broken.

In experiments with supplemental irrigation the experimental plats were watered from December 16 to June 8, the total amount of water given being 3½ in. During the drought in August one plat of milo maize received 3.14 in. of water, a second plat 1.32 in. of water, and a plat of sorghum 1.32 in. of water. The first plat of milo maize yielded 35.7 bu. of clean grain of high quality; the second, 24 bu.; and the sorghum yielded 3.24 tons of forage and 340 lbs. of clean seed per acre.

Work with summer fallowing in 1910 showed that considerable water may be accumulated in the soil during the rainy season but that it is lost before the next rainy season begins. A plat cropped in 1909 and fallowed in 1910 yielded this year 29.9 bu. of milo maize per acre, but this result was attributed to the excellent condition of the soil rather than to fallowing. The lighter types of soil in Sulphur Springs Valley appear to be better adapted to dry farming than the heavier types. Milo maize seems best adapted to grain production and sorghum to the production of forage.

The Snowflake dry farm was broken during the winter of 1909–10 and plantings were made in May, 1910. The crops as well as the land were injured by heavy winds. The grain of milo maize, sorghum, Kafir corn, and Red Dent corn did not mature. The yields of forage on plats irrigated once before planting ranged from 1,680 lbs. for White Flint corn to 4,960 lbs. per acre for Kafir corn. On land summer-fallowed the previous year the lowest yield of forage was 2,400 lbs. per acre for Kafir corn and the highest 4,108 lbs. for broom corn.

[Variety and manurial tests with cereals and root crops], P. H. FOULKES ET AL (*Field Expts. Harper-Adams Agr. Col., and Staffordshire and Shropshire, Rpt. 1911, pp. 1–23, 27–44*).—This continues earlier work (E. S. R., 26, p. 230).

The 8-years' annual average net profit following fertilizer applications to meadow land were greater in case of the use per acre of (1) 2½ cwt. of super-

phosphate and ⅓ cwt. of sulphate of potash, and (2) 2½ cwt. of superphosphate, than in case of other applications of nitrate of soda, superphosphate, sulphate of potash, basic slag, and dung singly or in various mixtures and amounts.

Tables state the yields secured in tests of 19 wheat varieties or strains, 2 of barley, 13 of oats, 12 of sugar beets, and 51 of potatoes.

In a test of 8 different fertilizers an application of 550 lbs. of superphosphate produced a 3-years' average yield of about 1 bu. less barley than did 4 cwt. of potassic superphosphate, at the same expense. Four cwt. of potassic superphosphate applied with 84 lbs. sulphate of ammonia, 130 lbs. nitrate of lime, and 112 lbs. nitrate of soda each supplying the same amount of nitrogen were followed by average yields of 49⅛, 50⅝, and 48 bu. per acre, respectively. All other applications in this test were surpassed in grain yield by the use of 2 mixtures of kainit, superphosphate, and sulphate of ammonia.

Sugar beets sown in rows 15 in. apart on level ground produced somewhat greater yields than those sown in rows 18 or 21 in. apart. They also slightly excelled plantings 21 in. and 24 in. apart on ridges. In another test seeding at the rate of 20 lbs. per acre produced slightly greater yields than seeding at the rates of 10 and 15 lbs. per acre. In a test of applications of sulphate of ammonia, superphosphate, sulphate of potash, and nitrate of soda, in 7 different mixtures no marked difference in yield was obtained, but the highest yield followed an application of 150 lbs. sulphate of ammonia, 368 lbs. superphosphate, 64 lbs. sulphate of potash, and 100 lbs. nitrate of soda.

The records kept indicate that mangels cost £10 13s. 5d. per acre to produce and yielded 43 tons 8 cwt. of roots as compared with £12 8s. 8d. for sugar beets which yielded 20 tons 9 cwt. of roots. A table states the average weight per root and the sucrose and dry matter contents of the roots grown in the method of sowing, rate of seeding, and fertilizer tests. In a test of 10 compound manures for mangels the highest yield followed the use of 5 cwt. of a mixture which supplied 11.2 lbs. of nitrogen, 67.2 lbs. of soluble phosphates, 44.8 lbs. of insoluble phosphates, and 28 lbs. of potash per acre. The addition of 2 per cent of a radioactive fertilizer to a mixture of steamed bone, sulphite of potash, and nitrate of soda was followed by a yield of 33 tons 13 cwt. of mangels as compared with 29 tons 11 cwt. on the check. A similar 2 per cent addition to another mixture apparently increased the yield of swedes from 12 tons 18½ cwt. to 15 tons 11½ cwt.

Fertilizer experiments on grass plats at Blurton and other centers are again reported with results varying somewhat from those of previous years.

Other work reported includes tests of sulphate of ammonia, superphosphate, dissolved bone, sulphate of potash, carbonate of magnesia, nitrate of lime, basic slag, kainit, and salt in various mixtures for potatoes, mangels, and sugar beets in different localities.

Field experiments in 1910, N. Tulaikov (*Kratkiĭ Otchet Polev. Opyt. Bezenchuk. Selsk. Khoz. Opytn. Stantsiĭ, 1910; abs in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 12 (1911), No. 4, pp. 571, 572*).—This is a report of the work of the Bezenchuk Agricultural Experiment Station in 1910. It states the results of tests of various fertilizers and various systems of fallows for winter rye. Somewhat similar work was done with summer oats and barley. Rates and methods of sowing summer cereals were tested, and variety tests of wheat, oats, millet, potatoes, and sugar beets were conducted.

Plowing 7 in. deep was followed by higher yields of winter cereals than were obtained by plowing either 3½ or 10 in. deep. In case of summer cereals the best results were obtained by early plowing 7 in. deep, or by late shallow plowing. The potatoes were apparently not influenced by the depth of plowing.

The most favorable area per corn plant appeared to be 336 sq. in.

[Experiments at the Kaiser Wilhelm Institute for agriculture], GERLACH (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 3 [1910], No. 1, pp. 5–30*).—Brief progress reports are given of work on irrigation, rate of sowing rye and barley by the Demtschinsky methods, tests of various nitrogen-supplying fertilizers, electro-culture, legume inoculation, and variety tests of rye, wheat, barley, oats, potatoes, and mangels. Citations are given to numerous publications in which results of these tests are more fully stated.

Irrigation experiments of the division of agricultural chemistry in 1909, GERLACH (*Mitt. Kaiser Wilhelms Inst. Land. Bromberg, 2 (1910), No. 4, pp. 454–465*).—These pages report the tests conducted in 1909 with mangels, rye, alfalfa, oats, and potatoes. Tables state in full the results obtained.

It appeared inadvisable to apply nitrate of soda to rye on a very light soil in a dry year unless irrigation was resorted to.

The water economy of dry-land crops, T. H. KEARNEY and H. L. SHANTZ (*U. S. Dept. Agr. Yearbook 1911, pp. 351–362*).—This article in treating of water as a factor in plant growth discusses absorption, transpiration, and water requirements; and in treating of the means by which plants succeed under dry-land conditions describes the adaptations for enduring, evading, and escaping drought.

Some misconceptions concerning dry farming, E. C. CHILCOTT (*U. S. Dept. Agr. Yearbook 1911, pp. 247–256*).—This article discusses precipitation; temperature and length of season; effects of evaporation, hail, and hot winds; diversity of soils; tillage, with special reference to summer fallowing, deep plowing, and preparation of the seed bed; and penetration of the roots into the subsoil in their relation to dry farming.

"The following misconceptions concerning dry farming may be mentioned as among the most serious: (1) That any definite 'system' of dry farming has been or is likely to be established that will be of general applicability to all or any considerable part of the Great Plains area; (2) that any hard and fast rules can be adopted to govern the methods of tillage or of time and depth of plowing; (3) that deep tillage invariably and necessarily increases the water-holding capacity of the soil or facilitates root development; (4) that alternate cropping and summer tillage can be relied upon as a safe basis for a permanent agriculture or that it will invariably overcome the effects of severe and long-continued droughts; and (5) that the farmer can be taught by given rules how to operate a dry-land farm."

Rotations in the corn belt, C. B. SMITH (*U. S. Dept. Agr. Yearbook 1911, pp. 325–336*).—This article discusses cost and profit in corn growing, and points out the disadvantages of continuous corn culture and the advantages of growing corn in rotation. The rotations discussed are corn and oats; corn, oats, and clover; corn, corn, oats, and clover; corn and clover; corn, wheat, and clover as a catch crop; corn, oats, wheat, and clover; corn, cowpeas or soy beans, wheat, and clover; corn and alfalfa; corn and rye; corn and barley; and a number of miscellaneous rotations. The principles governing the establishing of rotations are touched upon and the use of leguminous crops and the applications of fertilizers in corn belt rotations are noted.

Wheat and oats, J. L. BURGESS (*Bul. N. C. Dept. Agr. Sup., 32 (1911), No. 10, pp. 24, figs. 5*).—Results of variety tests of wheat and oats at the Buncombe and Iredell test farms accompany directions for producing these crops. Earlier wheat and oat work at these farms has already been noted (E. S. R., 24, p. 142).

Report on field trials with varieties of oats and wheat in 1909, T. MILBURN (*Midland Agr. and Dairy Col. Bul. 7, 1909–10, pp. 63–71*).—Steadfast, Marvel, and Sensation, 3 French wheat varieties, yielded on the average about 6 bu.

more grain per acre than did the English varieties Browick Grey Chaff and Carter White Stand Up. The French varieties, especially Marvel, showed many ears affected by loose smut.

Probsteier and White Horse oats gave equal average yields and somewhat outyielded the other 4 varieties tested in the same 5 localities.

Report on field trials on the manuring of seeds hay in 1909, J. F. Blackshaw (*Midland Agr. and Dairy Col. Bul. 2, 1909–10, pp. 15–25*).—This is a report of tests undertaken in 16 localities for the purpose of determining whether seeds hay (rye grass and clover, one year's seeding) can profitably be treated with artificial fertilizers. Nitrate of soda, superphosphate, sulphate of ammonia, sulphate of potash, kainit, and muriate of potash were applied in various mixtures and on various dates in March and April. Almost equal 3-year average profits followed the use of 200 lbs. of kainit and 50 lbs. of muriate of potash, each in addition to a mixture of 100 lbs. of sulphate of ammonia and 208 lbs. of superphosphate. These applications were all made early in April except the potash which was applied early in March. Each of the 8 other applications tested gave lower average profits.

[Fertilizer and variety tests with meadow hay, swedes, and potatoes] (*Ann. Rpt. Cumberland and Westmoreland Farm School, 15 (1911), pp. 8–10*).—The 14-year average yield of meadow hay unfertilized was 30 cwt. per acre; after an application of 10 tons of dung, 42 cwt.; ¾ cwt. nitrate of soda, 1½ cwt. kainit, and 3 cwt. basic slag, 38 cwt.; ¾ cwt. sulphate of ammonia, 1½ cwt. kainit, and 3 cwt. of basic slag, 35 cwt.; ¾ cwt. nitrate of soda, 1½ cwt. kainit, and 3 cwt. of superphosphate, 40 cwt.; and after an application of ¾ cwt. of sulphate of ammonia, 1½ cwt. of kainit, and 3 cwt. of superphosphate, 36 cwt. of hay per acre.

Two-year average yields of 45 and 48 cwt. of hay per acre, respectively, followed applications of (1) ¾ cwt. of nitrate of lime, 1½ cwt. of kainit, and 3 cwt. superphosphate, and (2) ¾ cwt. of calcium cyanamid, 1½ cwt. kainit and 3 cwt. of superphosphate.

Five tons of swedes per acre were secured from the unfertilized plat as compared with 31½ tons after 1⅓ cwt. of nitrate of lime, 2 cwt. kainit, and 5 cwt. of superphosphate; 29 tons after the same mixtures of nitrate of lime and kainit, with 5 cwt. basic slag instead of the superphosphate; 30½ tons after 1 cwt. nitrate of soda, 2 cwt. kainit, and 5 cwt. superphosphate; 31¼ tons after 3⅛ cwt. kainit, and 7¼ cwt. basic slag; 27¼ tons after 12 tons of dung; 32 cwt. after 12 tons of dung, ⅓ cwt. nitrate of lime, ½ cwt. kainit, and 1¼ cwt. superphosphate; and 31½ tons after an application of 1 ton of ground lime stone in addition to the last named mixture.

A variety test of potatoes is also reported.

Trials with millets and sorghums for grain and hay in South Dakota, A. N. Hume and M. Champlin (*South Dakota Sta. Bul. 135, pp. 309–336, figs. 8*).—This bulletin reports the results of experiments carried on in the years 1907–1910 at Highmore in cooperation with this Department.

The highest average yield of grain secured from any variety of millet from 1907–1910 was 17.6 bu. per acre from common millet. The next highest average yield was 16 bu. per acre from Black Voronezh, this being also practically the yield from Kursk and Tambov millets. The Kursk varieties in 1910 produced a higher yield of hay than the other varieties and yielded 24.7 bu. of grain, the average of the highest yields of the variety for all seasons. Taking the yield of hay and grain into consideration, the authors regard the Kursk millets as the most promising.

It was found that the grain sorghums require a longer time to mature than millet. The average yield of grain per acre for 3 strains of grain sorghum for 3 years (1909–1911), including 2 extremely dry seasons, was 13.7 bu. per acre.

Alfalfa growing in Alberta, W. H. Fairfield and G. H. Hutton (*Canada Expt. Farms Bul., 2. ser., 1912, No. 8, pp. 14*).—Directions for alfalfa production are given.

Varieties of barley (*Bedfordshire County Council, Agr. Ed. Com., Rpt. Barley and Sugar Beet Plots, 1911; abs. in Jour. Bd. Agr. [London], 18 (1912), No. 12, p. 1034*).—This is a report of a test of 10 varieties of barley on a light sandy soil in 1911. In 5-year average yields, Kinver Chevalier, Goldthorpe, and Prize Prolific stood highest.

Genetic studies of the genus Brassica, B. Kajanus (*Ztschr. Induktive Abstam. u. Vererbungslehre, 6 (1912), No. 4, pp. 217–237, pls. 4*).—These pages report the results of studies of color and form of numerous artificial crosses of different varieties of *Brassica napus, B. rapa, B. campestris, B. oleracea, B. lanceolata,* and *Sinapis arvensis* (*alba* and *nigra*).

Observations on the inheritance of characters in Zea mays, J. Burtt-Davy (*Separate from Trans. Roy. Soc. So. Africa, 2 (1912), pt. 3, pp. 261–270*).—The author presents statistical and other studies on an ear of corn obtained from a plant grown from a red flint grain and pollinated from other red-grain plants. His studies include row numbers in ears and the inheritance of row numbers and cob color.

When red dent was crossed with a white sugar corn, 2 pairs of characters were segregated in the second generation (1) redness and whiteness, and (2) starchiness and sugariness in approximately these proportions: (1) Red, starchy 56.25 and sugary 18.75 per cent, and (2) white, starchy 18.75 and sugary 6.25 per cent. One grain distinctly showed a starchy character in one-half and a sugary character in the other.

Within certain limits the number of rows of grain per ear were found subject to fluctuations. Crossing an 8 row with an 18 row type produced an intermediate type in which 10, 12, and 14 row ears appeared, the 12-row type greatly predominating.

Cooperative tests of corn varieties, E. R. Minns (*New York Cornell Sta. Bul. 314, pp. 395–410, figs. 3*).—This bulletin summarizes the results of testing varieties of corn in cooperative experiments carried on during 3 years.

It was found that elevation above sea level, as influencing the climate of a locality, and the type of soil, were highly important factors in corn growing. A high elevation combined with a soil type not suited to corn caused a failure or gave very poor results with varieties that gave good yields in other localities. The better type of soils at lower elevations gave much better results, especially when dent varieties were grown.

For elevations of 1,000 ft. or more, varieties of flint corn appeared better adapted for the production of ripe grain and stover than dent varieties, and for ensilage there were also a few good flint varieties and some early dent varieties that were preferable to very late dent corn. At elevations ranging from 600 to 1,000 ft. some flint varieties gave better yields of mature corn than dent varieties of equal earliness, while for ensilage both dent and flint varieties were found sufficiently productive in a normal season. For elevations lower than 600 ft., dent corn produced more satisfactory yields of grain and stover or silage than the flint varieties. These experiments were not carried on long enough to determine the individual varieties best adapted for either grain or fodder production in the different localities.

Cotton improvement on a community basis, O. F. Cook (*U. S. Dept. Agr. Yearbook 1911, pp. 397–410*).—This article discusses the desirability and feasibility of cotton improvement in the United States, and points out ways and

means by which this may be accomplished on a community basis. Special attention is given to the preservation of the uniformity of varieties.

"In order to maintain uniformity and produce commercial quantities of one kind of cotton communities should limit themselves to the cultivation and selection of a single superior variety. The choice of the variety to be grown, the production of good seed, the determination of the date of planting and the methods of cultivation, the harvesting, ginning, storing, and marketing of the crop are all problems that can be solved to much better advantage by community cooperation than by individual planters working alone."

Fibers used for binder twine, L. H. DEWEY (*U. S. Dept. Agr. Yearbook 1911, pp. 193–200, pls. 3*).—This article points out the requirements of binder twine fiber and gives descriptions of the following plants from which such fibers are obtained: Abacá (*Musa textilis*), henequen (*Agave fourcroydes*), sisal (*A. sisalana*), Phormium or New Zealand hemp (*Phormium tenax*), Mauritius (*Furcræa fœtida*), cabuya (*F. cabuya* and *F. cabuya integra*), Manila maguey (*Agave cantala*), mescal maguey (*Agave* sp.), zapupe (*A. zapupe, A. lespinassei*, and *A. deweyana*), flax, and hemp.

Manuring of hops, B. DYER (*Abs. in Jour. Bd. Agr. [London], 18 (1912), No. 11, p. 942*).—The report states the yields secured in tests of phosphate, potash, nitrate of soda, and dung, applied singly and in various mixtures to hops during the 16-year period 1896–1911 (E. S. R., 12, p. 46).

The use of more than 4 cwt. of nitrate of soda was followed by very slight increases of crop for the extra quantity. Chemical analyses and the estimation of values showed no difference between the hops grown with natural and those grown with artificial fertilizers. Even after liberal fall or winter applications of natural or artificial fertilizers the author believes that a spring application of 4 cwt. of nitrate of soda per acre is safe and profitable even in a wet season.

Orchard grass seed from different countries, F. G. STEBLER and A. VOLKART (*Landw. Jahrb. Schweiz, 25 (1911), No 2, pp. 171–188, figs. 4*).—The authors briefly review some work of others and report the results of tests of seed from France, New Zealand, America, Hungary, Holland, and certain German provinces.

Experiments on paddy cultivation during the years 1909–1911, L. C. COLEMAN and D. G. RAMA CHANDRA (*Dept. Agr. Mysore, Gen. Ser. Bul. 2, 1912, pp. IV+44, pls. 2*).—This reports mainly results of variety, fertilizer, and cultural tests of rice.

Seed which sank in a solution of one part of salt to two parts of water had a higher germination percentage and greater weight per kernel, as well as a higher density, than that which floated.

Growth of sugar beet (*Bedfordshire County Council, Agr. Ed. Com., Rpt. Barley and Sugar Beet Plots, 1911; abs in Jour. Bd. Agr. [London], 18 (1912), No. 12, pp. 1034, 1035*).—This is a report of experiments conducted to determine the feasibility of growing sugar beets in various districts, including the results of variety, cultural, and fertilizer tests. The sugar percentage varied little.

Nitrogen fertilization and the composition of sugar beets, H. SÁNDOR (*Kísérlet Közlem., 14 (1911), No. 5, pp. 655–675, figs. 2*).—Increasing nitrogen applications on pure sandy soil, low in humus, increased the beet yield, especially the yield of leaves. The lowest sugar content followed the lowest nitrogen applications. The proportion of dry matter was apparently not affected, except in case of the nonsugar substances. Very heavy nitrogen fertilization increased the injurious nitrogen disproportionately, but the increase was not regular when potash and phosphorus were present in sufficient quantities.

Manuring of swedes (*Univ. Col. Reading, Dept. Agr. and Hort. Bul. 10, 1910; abs. in Jour. Bd. Agr. [London], 18 (1912), No. 11, p. 942*).—This is a report of the results of tests at 5 points in Oxfordshire of superphosphate, steamed bone flour, and basic slag, singly and mixed with sulphate of potash and sulphate of ammonia, or in case of basic slag, with nitrate of soda instead of sulphate of ammonia. The results at different points varied, the deciding factor apparently being the amount of lime in the soil.

The production of new and improved varieties of timothy, H. J. WEBBER ET AL. (*New York Cornell Sta. Bul. 313, pp. 337–391, figs. 42*).—A previous report on this line of work has already been noted (E. S. R., 23, p. 536). This bulletin discusses timothy as an agricultural crop, describes the methods used in the Cornell breeding and selection experiments, points out some of the more striking variations observed, and gives notes on testing selected plants of different types, testing the transmission of type in selections when grown from seed, and on the method of isolating a pure type and multiplying the seed. A method of improving timothy and recommended for the use of farmers is also given. An appendix to the bulletin summarizes the work reported by H. J. Waters (E. S. R., 26, p. 265).

A table on the transmission of yield in timothy by clonal and seed propagation with 16 plants from each individual, the different rows being placed 4 ft. apart and the plants 3 ft. apart in the rows, shows clearly the great range of variation in this character. Taking the average yield for the second and third years of all the 16 plants of one kind, the lightest yielder averaged 1.005 oz. per plant and the heaviest 20.274 oz. per plant. Among the 200 plants entering into this test, 5 gave for the 2 years an average yield per plant of 1 lb. or more, while 39 gave average yields of less than ½ lb. per plant.

In a study of the effect of self-fertilization on vigor, it was found that in 9 tests with different types, the average yield per plant for all plants tested was for the original plants 9.307 oz., for the clons 8.769 oz., for the open-fertilized seed 6.963 oz., and for the self-fertilized seed 5.243 oz. The yield of the original plants in this test represents a 3-year average, while in the other cases the result is based on a 2-year average.

A test of the new varieties of timothy gave as average yield in 1910 for 17 new sorts of 7,451 lbs. of field-cured hay per acre, while the check plats sown with a good grade of commercial seed gave an average yield of 6,600 lbs. In 1911, a much more unfavorable season than the preceding year, the 17 new sorts yielded 7,153 lbs. per acre and the check plats 4,091 lbs. The actual average increase in favor of the new varieties was 851 lbs. per acre in 1910 and 3,062 lbs. in 1911. The hay produced by the new varieties was apparently of superior quality owing to the retention of a fresh green appearance and leafiness. This is considered due in the main to the greater rust-resistant character of the new sorts and to the fact that the majority of them were selected as possessing the ability to retain their leaves and stems green until the heads have become fully matured.

Correlation and inheritance in Nicotiana tabacum, H. K. HAYES (*Connecticut State Sta. Bul. 171, pp. 3–45, pls. 5*).—The characters studied with reference to correlation and inheritance were number of leaves per plant, height of plant, average area of leaf, and length and breadth of leaf. The types of tobacco studied in this connection were Uncle Sam Sumatra, Broadleaf, Havana, Small-leafed Sumatra, and Cuban. With the exception of the Broadleaf strain, these types had been inbred for a number of years and were uniform to type.

In the study of the correlation of parts, the Broadleaf and Small-leafed Sumatra types were used. In these 2 types and in the first and second

generation crosses between them, the Sumatra being the female parent, there was a positive correlation between number of leaves and height of plant, although in all but one case this was less than +0.5. It was further shown that a large number of leaves was associated with a slightly smaller leaf area and that the longer leaves were on the average also the broader ones.

The inheritance of characters was studied in crosses between Cuban and Uncle Sam Sumatra, Uncle Sam Sumatra and Cuban, Small-leafed Sumatra and Broadleaf, and Havana and Cuban, the first mentioned being the female parent in each case. Environment was found to be an important factor in producing fluctuating variabilities. The number of leaves per plant under normal or nearly normal conditions was least affected. The reciprocal crosses appeared to be equal within the limits of fluctuating variability. The F_1 generation was intermediate in the character studied and was, as a rule, somewhat larger than the average of the parents. All of the characters considered except the number of leaves per plant showed added vigor. This generation did not appear more variable than the parents, the variability being slightly greater than the average of the parents in 6 cases and less in 5. Different variates in F_1 gave similar results in F_2 which is regarded as indicating that the fluctuating variation was due to environment. The F_2 generation was more variable than the parents. When sufficient numbers of variates were studied, the F_2 showed a range of variation equal to the combined range of the parents and the F_1 generation. Leaf number and average leaf area appeared to be inherited independently, and it is pointed out that this being the case the desirable leaf-size characters of one variety may be combined with the number of leaves of another form. The results also showed some variation in the correlation between height of plant and number of leaves, and a large positive correlation was apparent between length and breadth of leaf.

The author concludes that the results are entirely in accord with the Mendelian interpretation of quantitative characters by the hypothesis that a multiplicity of factors exists, each independently inherited and capable of adding to the character. Observations on the cured leaf of several F_1 crosses indicated that the leaves of this generation are low in quality.

The prospects for wheat cultivation in Natal, E. R. Sawer (*Agr. Jour. Union So. Africa, 2 (1911), No. 5, pp. 542–561, figs. 12*).—The author gives a classification of wheats, summarizes work of other experimenters, and states the results of variety and irrigation tests at Weenen.

Results of seed tests for 1911, F. W. Taylor (*New Hampshire Sta. Bul. 156, pp. 14*).—This bulletin presents in tabular form the results of seed tests made in 1911, and gives in addition the text of the law of New Hampshire passed in 1909 for the purpose of regulating the sale of agricultural seeds. During the year 72 samples of seed were examined as against 238 for the year before.

Purity and germination of agricultural and vegetable seeds sold in North Carolina, O. I. Tillman (*Bul. N. C. Dept. Agr., 32 (1911), No. 10, pp. 78, pls. 8, figs. 2*).—The text of the North Carolina pure seed act follows tables stating the results of purity and germination tests of seeds collected and analyzed in accordance with its provisions. Tests of samples submitted by correspondence are also reported.

Eradication of charlock and wild mustard, C. Sándor (*Kisérlet Közlem., 14 (1911), No. 5, pp. 720–727*).—All the field mustard was killed when sprayed with a 20 per cent solution of iron sulphate, but the destruction was less complete in case of charlock or wild radish. A proprietary powder was also tested.

Johnson grass control, F. W. Wilson (*Arizona Sta. Rpt. 1911, pp. 549, 550*).—This article deals with the control of Johnson grass and gives directions

for its eradication. The most satisfactory method employed on the station farm consisted in keeping the grass from seeding by close grazing or mowing and later digging up the roots.

HORTICULTURE.

The present status of horticulture in the Philippines and its outlook for the future, P. J. WESTER (*Philippine Agr. Rev. [English Ed.], 5 (1912), No. 7, pp. 353–364*).—The author reviews the horticultural conditions in the past and present, discusses the more prominent fruits and their possibilities, and calls attention to the neglect of nearby important markets.

Report of the Government Horticultural Gardens, Lucknow, for the year ending March 31, 1912, H. R. C. HAILEY (*Rpt. Govt. Hort. Gardens Lucknow, 1912, pp. 10*).—This comprises a short progress report relative to the administration of the gardens, together with acclimatization and other experimental work conducted during the year with fruit and food producing plants, and other trees and plants of economic value.

Report of the Government Botanical Gardens, Saharanpur, for the year ending March 31, 1912, H. R. C. HAILEY (*Rpt. Govt. Bot. Gardens Saharanpur, 1912, pp. 9*).—A progress report of the routine and miscellaneous work conducted during the year, including also acclimatization and other experimental work conducted with fruits, vegetables, and other economic plants.

The vegetable garden, W. S. BLAIR (*Ottawa: Govt., 1912, pp. 17*).—A brief popular treatise including cultural details for the more important vegetables.

Annotated list of Philippine vegetables, P. J. WESTER and O. W. BARRETT (*Philippine Agr. Rev. [English Ed.], 5 (1912), No. 7, pp. 371–374, pl. 1*).—This comprises a list of 47 Philippine vegetables, including local and botanical names together with brief notes on their character, economic value, and distribution.

Annotated list of Philippine fruits, P. J. WESTER and O. W. BARRETT (*Philippine Agr. Rev. [English Ed.], 5 (1912), No. 7, pp. 365–370, pls. 2*).—A list similar to the above is given for 66 kinds of fruits.

Recent plant introductions into the Philippines, P. J. WESTER (*Philippine Agr. Rev. [English Ed.], 5 (1912), No. 7, pp. 391–398*).—A review of the work of the Philippine Bureau of Agriculture in the introduction of fruits, vegetables, cereals, forage crops, and other economic plants.

Marcottage: Its utilization in the Tropics, H. H. BOYLE (*Philippine Agr. Rev. [English Ed.], 5 (1912), No. 7, pp. 385–390, figs. 3*).—This comprises a short résumé of the different methods of layerage employed in the Philippines, in the United States, and in Europe.

Anonaceous fruits and their propagation, P. J. WESTER (*Philippine Agr. Rev. [English Ed.], 5 (1912), No. 6, pp. 298–304, fig. 1*).—Methods of propagating the cherimoya (*Anona cherimolia*), the sugar apple (*A. squamosa*), the soursop (*A. muricata*), and the custard apple (*A. reticulata*) are described.

Promising new fruits, W. A. TAYLOR and H. P. GOULD (*U. S. Dept. Agr. Yearbook 1911, pp. 423–438, pls. 8*).—In continuation of similar articles (E. S. R., 25, p. 540) historical notes with descriptions and color plates are given of the following new and little-known fruits that are considered worthy of more extensive trial: Cornell, San Jacinto, and Shiawassee apples; Laire and Moncelt plums; Panariti grape; the Thomson orange; Ayer pear; and Russell peach.

Orchard notes, W. W. BONNS (*Maine Sta. Bul. 199, pp. 33–56, pls. 8, fig. 1*).—A progress report on experimental work in pomology conducted by the station since its acquisition of the Highmoor Farm in 1909, including also some pomological notes discussing a successful method of emasculating blossom buds, teratology, and winter injury.

During 1910 and 1911 the Highmoor orchards received a general renovation and one block of trees was divided to include spraying experiments, previously noted (E. S. R., 27, p. 440), sheep pasturage, hog pasturage, and fertilizer experiments. A sod plat was retained as a check.

As compared with the previous condition of the orchards, the work of renovation was highly successful. The chief factor accountable for low production per tree was found to be the lack of cultivation. Lack of vigor and vastly insufficient growth were everywhere evident in the sheep, hog, and sod plats. No conclusions can be drawn as yet relative to the comparative effect of inorganic versus organic fertilizers.

The method of emasculating blossom buds at the station consists in laying back the enfolded petals and removing the anthers with a small portion of the filament by means of a small, thin-bladed scalpel with thin cutting edge tapering to an acute V. The fruit obtained in the crossing work of the past season all resulted from buds emasculated in the above manner. No fruits were set on blossoms in which the petals were removed before castration.

Following the winter of 1910–11 a considerable amount of winter injury to the trunks of trees was noted in a number of localities. This injury took the form of a severe loosening and splitting of the bark of the trunk. In less serious cases longitudinal splits occurred, extending through the living tissues to the wood. Although the cause of the injury is not definitely known it is suggested that it may be due to insufficient soil drainage and a sudden temperature drop below the freezing point following a period of warm weather.

Apple growing, M. C. Burritt (*New York, 1912, pp. 177*).—A popular work dealing especially with the small apple orchard on the general farm. The successive chapters discuss the outlook for the growing of apples, planning for the orchard, planting and growing the orchard, pruning the trees, cultivation and cover cropping, manuring and fertilizing, insects and diseases affecting the apple, the principles and practice of spraying, harvesting and storing, markets and marketing, some hints on renovating old orchards, and the cost of growing apples.

Apple growing in the Pacific Northwest, C. I. Lewis et al. (*Portland, Oreg., 1911, pp. 215, figs. 60*).—A condensation of lectures, experiments, and discussions conducted by various authorities relative to different phases of apple growing.

The fibro-vascular system of the apple and its functions, D. McAlpine (*Proc. Linn. Soc. N. S. Wales, 36 (1911), pt. 4, pp. 613–625, pls. 5*).—A detailed study of the structure of the mature apple with special reference to the fibro-vascular system. A number of illustrations of various phases of the vascular system are included.

The fibro-vascular system of the pear, D. McAlpine (*Proc. Linn. Soc. N. S. Wales, 36 (1911), pt. 4, pp. 656–663, pls. 4*).—A briefer study, similar to the above, of the fibro-vascular system of the pear.

Experiments with artificial root pressure, C. Vallejo (*Bol. Min. Agr. [Buenos Aires], 14 (1912), No. 4, pp. 386–396, figs. 9*).—The experiments reported comprised the introduction of various nutrient solutions into the roots of a number of young newly transplanted Kieffer pears. The normal solution consisted of calcium and potassium nitrates, potassium chlorid, sodium phosphate, magnesium sulphate, and distilled water. In the variant solutions one or the other of the above ingredients was omitted. The experiment was conducted primarily to determine whether an excessive supply of nutrients would be conducive to the formation of fruit buds.

Negative results were secured with reference to the formation of fruit buds. No difference was noted between the various solutions used as measured by the

condition of the trees. The introduction of a nutrient solution into the root appears to have a temporary value in re-establishing growth conditions in newly transplanted trees.

[Peach culture] (*Ontario Dept. Agr. Bul. 201, 1912, pp. 59, figs. 24*).—This is a two-part bulletin dealing with the culture and diseases of the peach.

I. *Peach growing*, by F. M. Clement (pp. 1–31).—This discusses the methods of growing peaches as based on experience and observation in the Niagara Peninsula, as well as on the results of experimental work in different parts of the United States.

II. *Peach diseases*, by L. Caesar (pp. 33–59).—This describes the most important peach diseases of Ontario, together with methods for their control.

Artificial date ripening, A. E. Vinson and W. H. Ross (*Arizona Sta. Rpt. 1911, pp. 563–565*).—Date ripening investigations (E. S. R., 25, p. 745) were continued in 1911. The season was exceptionally unfavorable to natural ripening of dates and demonstrates the desirability for ripening all classes of dates artificially. Tests made during the year indicate that evenness of maturity is one of the most important factors in successful date culture in most parts of southern Arizona. Varieties that mature evenly can be artificially ripened without loss into high quality fruit in the most adverse seasons, whereas varieties that mature less evenly, such as Rhars, will yield at any given time only a small percentage of first quality fruit when artificially ripened.

Two lots of Rhars dates ripened by nitrous ether vapor produced 55 and 59 per cent, respectively, of first quality fruit. An attempt to ripen artificially sound Deglet Noor dates by heat yielded only an inconsiderable amount of usable but inferior fruit.

Notes are given on promising varieties of dates for southern Arizona.

Marketing problems, A. W. Morrill (*Arizona Sta. Rpt. 1911, pp. 554, 555*).—A brief discussion of suggested improvements in the marketing of the Arizona navel orange crop.

The reduction of waste in marketing, F. Andrews (*U. S. Dept. Agr. Yearbook 1911, pp. 165–176*).—In this article the author describes the working of 2 general plans which have been extensively used during the past 10 or 15 years to reduce the cost of marketing fresh fruits and vegetables. One plan is used by shippers to distribute consignments among cities and towns in such a manner as to avoid a glut; the other is employed by transportation companies in moving perishable freight quickly, and in rerouting it even when it is on the way to market.

The Weather Bureau and the cranberry industry, H. J. Cox (*U. S. Dept. Agr. Yearbook 1911, pp 211–222, pls. 4*).—In addition to a general account of the cranberry industry in the United States, investigations into frost and temperature conditions in Wisconsin cranberry marshes are described. It is stated that the investigations, which were conducted with the view of facilitating the forecasting of frost, have proved of great advantage to the growers.

Vines and vine culture, A. F. Barron (*London, 1912, 5. ed., rev. and enl., pp. XVI+211, figs. 95*).—A treatise on amateur and commercial grape growing in the conservatory and vineyard, including also chapters dealing with selection of grapes for special purposes, the classification of grapes, and varieties of European and American grapes.

The Oppenheim method of tying up vine shoots, F. Kober (*Allg. Wein Ztg., 25 (1910), No. 16, pp. 159–161; 26 (1911), No. 16, pp. 163, 164; 27 (1912), No. 4, pp. 34, 35; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 3, pp. 695–699, figs. 2*).—A system of training up grape vines between parallel movable sets of wires is here described and illus-

trated. This system, which has been employed for a number of years by the Viticultural School at Oppenheim, Hessen, is said to be a labor-saving method for tying young vine canes.

Early or late pruning, L. RAVAZ (*Taille Hâtive ou Taille Tardive. Montpellier, 1912, pp. 15*).—This comprises a progress report of experiments started in 1905 to determine the effect of pruning grapes at different times of the year on the vigor of the vine and production. The experiments were conducted in a young vineyard planted in 1905. Different rows were pruned as follows: Immediately after the vintage; at the time of leaf fall; during the dormant period; at the time the eyes first appeared; during the budding period; and when the terminal shoots were about 2 in. long. The shoots in all cases were cut back to 2 eyes.

A study of the results to date leads the author to conclude that pruning after the terminal shoots have started serves as a partial protection against spring frosts and increases production without materially affecting the vigor of the vine. The chief value of this late pruning appears to be due to the removal of the outlying buds which are the first to open in the spring.

The author questions whether the bleeding caused by pruning after the shoots have started is harmful. To avoid this, however, and still prevent the vines from starting too early in the spring all unnecessary growth may be removed during the dormant period, the fruiting shoots shortened somewhat, and all eyes removed except the two nearest the base. Since the basal eyes are affected by the length of the shoot rather than by the number of eyes beyond them they will not start any earlier in the spring for having the remaining eyes removed. The author found that sulphate of iron, which has been suggested as a dressing to prevent bleeding, has a tendency to increase the sensibility of the tissues to cold.

Contribution to the physiology of the graft.—Influence of the stock on scion, G. RIVIÈRE and G. BAILHACHE (*Jour. Soc. Nat. Hort. France, 4. ser., 13 (1912), June, pp. 360–363*).—In continuation of previous investigations (E. S. R., 24, p. 641), experiments with the Chasselas doré grape grown on various American stocks and on its own roots are reported.

The authors conclude that the operation of grafting in itself causes only slight modifications in the nature of the product of the scions. The scion and its products, however, do appear to be modified by the particular stock used, certain stocks increasing and others diminishing the particular characteristics of the scion.

The hybrid direct bearers in the valley of the Rhone in 1911, A. DESMOULINS and V. VILLARD (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 33 (1912), Nos. 27, pp. 13–21; 28, pp. 49–56*).—As in previous years (E. S. R., 24, p. 545), notes and data are given of a large number of hybrid direct bearing grapes. The hybrids are classified relative to their resistance to the serious drought in 1911, as well as their resistance to mildew, the nature of the soil best suited for them, and according to the intensity of the coloration of their must.

Report of the enological station relative to its history, developments, and results obtained from the time of its establishment up to November 31, 1910, V. C. M. DE ZÚÑIGA (*Estac. Enol. Haro Mem., 1910, pp. 32, pls. 3*).—This report reviews the work of the enological station, Haro, Spain, for the period 1892 to 1910.

Report of the enological station of Haro for 1911, V. C. M. DE ZÚÑIGA (*Estac. Enol. Haro Mem., 1911, pp. 81*).—This report is similar in character to those noted in previous years (E. S. R., 25, p. 840), summarizing the progress made in laboratory and field investigations, assistance rendered, etc.

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Cacao experiments, 1911 (*Jour. Bd. Agr. Brit. Guiana, 5 (1912), No. 4, pp. 232–234*).—Data are given showing the yields of cacáo from the manurial experiment fields at the Onderneeming School Farm in 1911.

During the last 3 years the highest yield has been secured from heavily mulched plats. On the other hand an increased yield has been secured more cheaply by the application of sulphate of potash and superphosphate of lime.

Street trees, J. J. LEVISON (*Proc. Amer. Assoc. Park Supts., 13 (1911), pp. 35–47, figs. 4*).—A paper and discussion dealing with the fundamental principles of street tree planting, care, and selection of species.

Native trees as hedge plants, A. W. GREEN (*Jour. New Zeal. Dept. Agr., 4 (1912), No. 6, pp. 444–448, figs. 6*).—Notes are given on a number of New Zealand trees which are proving desirable as hedge plants.

FORESTRY.

Economic woods of the United States, S. J. RECORD (*New York, 1912, pp. VII+117, pls. 6, figs. 15*).—This is a guide or manual for the identification of the economic woods of the United States, including a discussion of the structural and physical properties of wood. Part 1 deals briefly with the more important structural and physical properties of wood, the structural properties being based upon the character and arrangement of the wood elements, and the physical properties being based upon the molecular composition of the wood elements. Part 2 comprises an artificial classification of the economic woods of the United States based upon the structural and physical properties of wood as discussed in part 1.

Frequent references are made to the literature on various phases of the subject, and lists are given of publications dealing with general classifications, characteristics, and uses of woods.

Commercial guide to the forest economic products of India, R. S. PEARSON (*Calcutta, 1912, pp. IX+155+XIII, pls. 7*).—Chapter 1 comprises a short résumé of the distribution and classification of the many types of forests found in British India, together with a note on the financial working of these forests. Chapter 2 discusses a large number of the more common timber trees of India and Burma, relative to the distribution, quality, and uses of the timber, approximate value, and yields in various localities. Chapter 3 deals with such minor products as cutch, gums, fibers, resins, tan and dye products, oil seeds, etc.

Experiments with jack pine and hemlock for mechanical pulp, J. H. THICKENS (*U. S. Dept. Agr., Forest Serv.* [*Pamphlet*], *1912, pp. 29, pls 15, fig. 1*).—Tests conducted cooperatively by the Forest Service and the American Pulp and Paper Association to determine the value of hemlock and jack pine as substitutes for spruce pulpwood are here reported in detail, including a discussion of the equipment used in the experiment, methods employed, calculation of results, comparison of yields, factors which influence quality and production, and a microscopic comparison of experimental pulps and commercial standards. Samples of paper produced from the various tests accompany the bulletin.

Not only have very promising sheets of pulp been obtained from both the hemlock and jack pine, but paper has been made from them on commercial machines, operating at high speed and under all other conditions of actual commercial practices, which has the strength, finish, and appearance of the standard news paper. The production per grinder, the horsepower consumption per ton, and the yield per cord approximate the averages which obtain in the grinding of spruce. Pulps composed of mixtures of hemlock, spruce, and jack pine in different proportions, which compare very favorably with the ordinary spruce ground wood, have also been obtained. The author concludes that

both jack pine and hemlock may be advantageously used, either singly or in various combinations, at least in the cheaper grades of paper.

Note on the antiseptic treatment of Pinus excelsa and P. longifolia sleepers with Avenarius carbolineum oil at Jagadhari, R. S. PEARSON (*Indian Forester, 38 (1912), No. 7, pp. 329–332*).—The method and results of treatment of over 700 railroad ties with *A. carbolineum* oil is described in detail.

Harvesting and preparation of balata in French Guiana, V. BOUCHER (*Bul. Off. Colon. [France], 5 (1912), No. 55, pp. 209–213*).—A short descriptive account.

Hevea brasiliensis or Para rubber, H. WRIGHT (*London and Ceylon, 1912, 4. ed., pp. XX+542, pls. 39, figs. 25*).—This work treats of the botany, cultivation, chemistry, and diseases of Para rubber. The successive chapters discuss the history of Para rubber and of rubber plantations; botanical sources of rubber; climatic conditions and rate of growth of *Hevea brasiliensis;* planting operations and methods of cultivation; cultivation of catch and intercrops; Hevea rubber soils and manuring; tapping operations and implements; how, where, and when to tap; methods in vogue on notable estates; effects of tapping; tapping and yields in the Amazon region, Malaya, Ceylon, South India, Dutch East Indies, Borneo, Africa, etc.; general considerations affecting yields; physical and chemical properties of latex; production of rubber from latex; the theory of coagulation; purification of rubber and washing machines; the drying and smoking of rubber; forms, branding, packing, handling, characters, and comparative value of plantation rubber; chemical and physical properties and testing of rubber; manufacture and composition of rubber articles; properties, uses, and distribution of seeds; diseases and pests of Hevea rubber trees; costs of production on estates; and estimated costs of planting in the middle east.

The influence of light on the quality of oak wood in the high-forest of the Vosges, P. GALLAND (*Rev. Eaux et Forêts, 51 (1912), No. 15, pp. 459–464*).—A study of oak forests in the Vosges leads the author to conclude that when oak trees are subjected to much greater light conditions than those under which they have been developed, they deteriorate in value to such an extent that where they occur in regeneration areas they should be removed before the work of regeneration is commenced. The ideal light condition for an oak forest is one in which the top of the tree is in open sunlight and the base in shade.

Establishment of mixed stands of spruce and beech as well as of pine and beech as the best means of avoiding the dangers which threaten pure stands of conifers, and for the improvement of the soil, D. TIEMANN (*Forstw. Centbl., n. scr., 34 (1912), Nos. 6, pp. 297–309; 7, pp. 345–353*).—In this article the author advocates the growing of spruce and pine in mixtures with beech in order to lessen such dangers as storms, snow, fire, and insect attacks which often do serious injury to pure stands of spruce and pine. The importance of mixed stands as a means of soil improvement is also discussed.

Winterkilling of evergreens, C. V. NASH (*Jour. N. Y. Bot. Gard., 13 (1912), No. 151, pp. 110–120*).—A large number of both coniferous and broad-leaved evergreens are listed and discussed relative to their behavior during the severe winter of 1911–12.

Forest conditions in Indiana, S. COULTER (*Proc. Ind. Acad. Sci., 1909, pp. 447–462*).—This comprises a study of forest conditions in Indiana, including recommendations relative to the maintenance of an adequate timber supply in the State.

Tree planting by farmers, C. R. TILLOTSON (*U. S. Dept. Agr. Yearbook 1911, pp. 257–268, pls. 3*).—This article discusses briefly, for the region east of Nebraska and north of Tennessee and North Carolina, the best trees to plant, the methods to be followed in planting them, and the products they yield.

The business aspect of National Forest timber sales, T. D. WOODBURY (*U. S. Dept. Agr. Yearbook 1911, pp. 363–370, pls. 4*).—A popular article discussing the various economic operations involved in the disposal of mature timber on the National Forests, including a comparison of the items of cost of operations in National Forest timber and in private timber areas.

Report on the forest administration of the Central Provinces for the year 1910–11, H. H. FORTEATH, H. H. HAINES, and A. W. BLUNT (*Rpt. Forest Admin. Cent. Prov. [India], 1910–11, pp. 59+LXXV, pl. 1*).—This comprises the reports of the conservators of forests relative to the administration of the state forests in the Northern, Southern, and Berar Circles of the Central Provinces for the year 1910–11. A review of the work by the chief conservator of forests is also given. All of the important data relative to alterations in forest areas, forest surveys, production, yields in major and minor products, revenues, expenditures, etc., are appended in tabular form.

Administration report of the forest circles in the Bombay Presidency, including Sind, for the year 1910–11, O. H. L. NAPIER ET AL. (*Admin. Rpt. Forest Circles Bombay, 1910–11, pp. 172*).—This is a report similar to the above relative to the administration of the state forests in the Bombay Presidency, including Sind, for the year 1910–11.

Progress report of forest administration in Coorg for 1910–11, H. TIREMAN (*Rpt. Forest Admin. Coorg, 1910–11, pp. 8+12*).—A report similar to the above relative to the administration of state forests in Coorg for the year 1910–11.

DISEASES OF PLANTS.

Some recent work on fungus diseases of plants, L. H. PAMMEL (*Trans. Iowa Hort. Soc., 46 (1911), pp. 188–198*).—Summaries are given of a number of publications relating to plant diseases, most of the literature noted being that of American authors.

Fungus diseases in Iowa for the year 1911, L. H. PAMMEL (*Trans. Iowa Hort. Soc., 46 (1911), pp. 172–179, pl. 1, figs. 10*).—Notes are given on miscellaneous fungus diseases noted during the period covered by the report, together with a discussion of the relation between meteorological conditions and the occurrence of different fungi.

Report on plant diseases observed during 1911, SOFIE ROSTRUP and F. K. RAVN (*Tidsskr. Landbr. Planteavl, 19 (1912), No. 1, pp. 44–76*).—This report gives an account of the fungus diseases and insect pests observed in Denmark during 1911.

Report on vegetable pathology, H. TRYON (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1910–11, pp. 74–78*).—Notes are given on a number of fungus and other diseases of field, orchard, and garden plants, and a discussion is presented of the enforcement of the diseases of plants act of Queensland, 1896.

Relations of parasitic fungi to their host plants.—I, Studies of parasitized leaf tissue, E. S. REYNOLDS (*Bot. Gaz., 53 (1912), No. 5, pp. 365–395, figs. 9*).—Details are given of studies made, with negative results, on about a dozen species to ascertain, if possible, any characteristic differences between parasitic action on leaf cells and on those of other parts of the plant. An extensive bibliography is appended.

Studies of some new Citromyces, G. BAINIER and A. SARTORY (*Bul. Trimest. Soc. Mycol. France, 28 (1912), No. 1, pp. 38–49, pls. 2*).—The results of a study of a number of new species of Citromyces are given, and 3 new species are described. The authors call attention to this group of fungi which possesses the property of producing citric acid from such media as glucose, etc., and state that while the fungi have morphological characters which make it impossible to

differentiate them, they do not produce the same effect when grown on culture media. They think the name Citromyces an inappropriate one, as other organisms that can not be referred to this genus produce citric acid from glucose, etc.

On root tumors, A. STIFT (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 41 (1912), No. 2, pp. 241–249, figs. 6*).—A discussion is given of a beet root deformation, claimed to be different as to character and cause from the tumorous growths usually described. The shape of growth, which in this case involves the main root and differences of composition are held to support this claim.

The causes of beet blight, L. PETERS (*Arb. K. Biol. Anst. Land u. Forstw., 8 (1911), No. 2, pp. 211–259, figs. 12; abs. in Ztschr. Pflanzenkrank., 22 (1912), No. 3, pp. 179, 180*).—The author holds that this disease is caused by *Pythium debaryanum*, *Phoma betæ*, and *Aphanomyces lævis*. The last named has not before been pointed out as a probable factor in this disease.

Investigations of the potato fungus Phytophthora infestans, L. R. JONES, N. J. GIDDINGS, and B. F. LUTMAN (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 245, pp. 100, pls. 10, figs. 10*).—This paper embodies the main facts in the development of the disease and of methods for its control by spraying and other standard practices, and also contributes a number of new facts as to the development of resting spores by the fungus. The work was begun and carried on to a considerable extent at the Vermont Station in cooperation with the Bureau of Plant Industry.

The potato disease termed the late blight and rot due to *P. infestans* is one of the most serious of all potato diseases in Europe and America. It is common in the northeastern States, being favored by rather cool, moist summers, but farther south and west it is less common and probably only occurs when introduced with seed from the North. It does not persist where late summers are warm and dry.

The disease does not attack the leaves, as a rule, until after the blossoming period. The fungus develops first on the foliage, from which it passes by means of spores that are washed into the soil to the tubers, in which it hibernates.

Studies of infection, transmission, and disease control have shown that tuber infection in the field may be prevented by spraying the soil even when the fungus is allowed to develop unchecked on the foliage. Tubers may be infected from contact with blighting foliage at digging time. Secondary infection of tubers may occur in the soil or in the storage bin.

When the tops are attacked by late blight the harvesting of the tubers should be delayed for some time after the death of the tops. Dry, cool storage is of primary importance to prevent the spread of the disease in bins, and the use of lime or formalin disinfection has proved valueless. Wind and water are considered the most important agencies in local spore distribution, although leaf-eating insects may carry the spores to some extent.

The method described by Jensen of covering the tubers to a depth of 4 to 5 in. was found valuable in preventing infection through the soil, and disinfecting tubers designed for seed purposes by exposure to dry heat, 40° C. for 4 hours, was also demonstrated to be of value in preventing the infection of the disease. The results of 20 years' spraying experiments at the Vermont Station have shown that spraying the foliage with Bordeaux mixture is an almost complete remedy against both the blight and the rot, and also operates beneficially to the potato plant in other ways (E. S. R., 26, p. 53).

The fungus causing this disease has been carried in pure culture since 1904 and a considerable number of facts determined relating to its life history. Strains have been grown continuously for more than 5 years without any evidence of change in pathogenicity or other characters. The limits of alkalinity, acidity, temperature, etc., for growth and spore formation have been deter-

mined. Bodies having the characters of thick-walled spiny resting spores have been produced that had the general appearance and cytological characters of oogonia, but no antheridia have been found. A search for these bodies in cultures on blocks cut from potato tubers revealed immature stages of what were considered the same bodies, but none has been found in decaying tubers following Phytophthora attacks. Somewhat similar bodies have been found in leaves killed by the fungus, but as yet the authors do not claim that resting spores occur in nature.

In connection with their investigations some varieties of potatoes have been found much more susceptible to disease than others, and a method of determining disease resistance, which consists of inoculating sterile blocks cut from the flesh of potato tubers with Phytopthora cultures, has given results that are fairly comparable with those obtained in the field. This method of judging rot resistant qualities is believed worthy of extended application. In general certain standard European varieties were found more highly resistant to the fungus than the standard American varieties. In attempting to determine the cause of resistance no definite information was found, but it apparently does not consist in differences in the relative acidity or in any other chemical factor that has been determined.

An extended bibliography is appended.

Ustilagineæ on Andropogon sorghum in America, A. A. Potter (*Abs. in Phytopathology, 2 (1912), No. 2, p. 98*).—In the course of an investigation on the smuts of America, the author reports having studied *Sphacelotheca reiliana*, *S. sorghi*, and *Ustilago cruenta*. The latter species has not been previously recognized in American literature.

Notes on some plant diseases of the sugar cane in the Hawaiian Islands, J. E. van der Stok (*Arch. Suikerindus. Nederland. Indië, 20 (1912), No. 18, pp. 609–631; Meded. Proefstat. Java-Suikerindus., 1912, No. 17, pp. 529–551*).—This article is the result of a visit of the author to the Hawaiian Islands in 1911, and gives accounts of a number of diseases of sugar cane, most of which have been previously described by Cobb (E. S. R., 18, p. 843; 22, p. 49).

Infection experiments with the powdery mildew of wheat, G. M. Reed (*Phytopathology, 2 (1912), No. 2, pp. 81–87*).—In a former paper (E. S. R., 21, p. 641) the author showed that biological specialization has resulted in distinct forms or races of mildews on each of the principal cereals, oats, barley, rye, and wheat. Further studies have shown that different varieties vary in their susceptibility, and in the present paper an account is given of investigations to test the resistance of varieties of wheat to wheat mildew.

In all, 78 varieties of wheat, representing 9 different species of Triticum, were studied, the inoculation material in nearly every instance being conidia from the Turkey Red wheat. Forty-nine of the 78 varieties gave 100 per cent infection. Fifteen of the remaining ones gave an infection of 70 per cent or higher, while of the remaining 14 varieties, 4 were infected to the extent of from 50 to 70 per cent, 6 gave only slight infection, and 4 were immune.

The greater number of varieties of *T. vulgare* were found susceptible to mildew, while the immune varieties belonged to the species *T. dicoccum* and *T. vulgare*. The varieties of the different species which showed a marked resistance to mildew were all spring varieties. In some cases where the same variety was grown as a winter and spring wheat, the winter variety was susceptible while the corresponding spring variety was relatively or entirely immune.

There was no evidence to indicate a specialization of wheat mildew within the genus on its various hosts.

In conclusion the author calls attention to the fact that the immunity which a host plant enjoys from mildew may be due largely to environmental conditions. From a large number of experiments he has carried on he has reached the conclusion that water supply, nutrition, relative abundance of spores, etc., play an important part in the susceptibility or immunity of a particular plant to fungus parasites.

Notes on some apple diseases, F. A. WOLF (*Proc. Ala. State Hort. Soc., 9 (1912), pp. 69–75*).—Popular descriptions and methods for control of the bitter rot and rust of apples are given.

Canker diseases of apple trees, PROBST (*Gartenwelt, 16 (1912), No. 21, pp. 284–286*).—The author discusses the difference in susceptibility of different varieties of apple trees to canker, due to *Nectria cinnabarina*, and the relation of the fungus to frost and other injuries of the trees.

The fungus is considered a wound parasite. The cankers are said to be more liable to appear on trees in poor dry soils and in soils in which the water table is near the surface. Planting in such situations should be avoided, and especially susceptible varieties should not be employed in setting orchards. Where cankers are found upon the trees they should be carefully cut out from the trunks and larger limbs and the wounds covered with coal tar. When on smaller branches the whole branch should be cut off and burned.

Two apple cankers, H. S. FAWCETT (*Mo. Bul. Com. Hort. Cal., 1 (1912), No. 7, pp. 247–249, figs. 2*).—Descriptions are given of 2 forms of apple canker, due to *Nectria ditissima* and *N. cinnabarina*.

Apple scab infection as correlated with maturity of ascospores, weather conditions, and development of fruit buds, E. WALLACE (*Abs. in Phytopathology, 2 (1912), No. 2, pp. 94, 95*).—From observations covering a period of 3 years in New York it is concluded that if the weather conditions are favorable the primary spring infection usually occurs about the time the ascospores mature, that is, usually about the time the apple blossoms are ready to open. There is believed to be little probability of serious infection earlier than this, whatever the weather conditions may be. Later secondary infections were studied, and the date of attack and relation of rain to infection were determined.

Frost injuries to apples, A. NAUMANN (*Reprint from Ztschr. Obst u. Gartenbau [1911], No. 2, pp. 4, figs. 2*).—This is a brief discussion with illustrations of conditions observed to follow low temperatures on young fruits, including invasions by fungi, etc., favored by such injuries.

Gum diseases in citrus trees, H. S. FAWCETT (*Mo. Bul. Com. Hort. Cal., 1 (1912), No. 5, pp. 147–156, figs. 5*).—Descriptions are given of a number of diseases of citrus trees in California, and comparisons made with similar diseases in Florida. The diseases described are gummosis or lemon gum disease; scaly bark of California, which is said to be the same as psorosis in Florida; foot rot or mal di gomma, which is common in Florida and rare in California; root rot, due to some of the higher fungi; and Diplodia gumming and Florida scaly bark, both of which are present in Florida but thus far have not been reported in California.

A new species of Pyrenomycetes, N. NAOUMOW (*Bul. Trimest. Soc. Mycol. France, 28 (1912), No. 1, pp. 55, 56, fig. 1*).—A description is given of a new fungus, *Plcospora batumensis* n. sp., which was found attacking the petioles of orange leaves in the south of Russia.

The treatment of downy mildew, black rot, and powdery mildew, J. LEROY (*Rev. Vit., 37 (1912), No. 957, pp. 526–528*).—The author describes methods for combating the above diseases that have been repeatedly tested with success by growers.

For the downy mildew 3 treatments with liquid fungicides followed by 2 with powdered sulphates, for the black rot 4 treatments with liquid fungicides and 2 with powdered sulphates, and for the powdery mildew 2 treatments with pure sulphur combined with the necessary complementary treatments with powdered sulphates are said to be sufficient for the control of these diseases. The time for the different applications will vary with atmospheric and other conditions. The liquid fungicides recommended are Bordeaux mixture, Burgundy mixture, Bordeaux mixture to which molasses is added to improve its adhesiveness, and copper acetate solutions, formulas for the preparation of which are given. In choosing the powders there is said to be but little difference, except that the first-named should should contain at least 50 per cent sulphur.

Infection of the grape by downy mildew, L. RAVAZ and G. VERGE (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 33 (1912), No. 19, pp. 581–584*).—In continuation of previous work (E. S. R., 27, p. 49), the authors investigated the susceptibility of flowers, fruits, pedicels, peduncles, and shoots of several varieties of grape to mildew attack. They conclude from these that the fruit stems are less open to infection than are the leaves, that the flowers are most liable to attack, and that the berries were not contaminated in any case. Density of tissue and rarity of stomata are supposed to be in a measure protective in this connection.

The influence of weather on Peronospora disease of grape, R. GERNECK (*Weinbau u. Weinhandel, 30 (1912), No. 18, pp. 199, 200*).—A short discussion is given of the conditions favoring attacks by this disease as illustrated by observations of recent years. Such conditions are said to be heavy rainfall, heat, and shade. Storms furnish all these conditions at once, and have been followed by notable outbreaks.

A new parasite of the grape, L. PLANCHON (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 33 (1912), No. 22, pp. 676–686, pl. 1, figs. 7*).—A description is given of *Osyris alba*, a phanerogamic plant which is reported growing as a parasite or hemiparasite on the roots of grapes in parts of France.

A mulberry disease, R. AVERNA-SACCÀ (*Bol. Agr. [São Paulo], 12. ser., 1911, No. 9–10, pp. 727–740, figs. 3*).—An account is given of the symptoms and spread of a leaf spot disease which is ascribed by the author to *Sphærella moricola* and is said to have been confused with that due to other organisms, as in case of mulberry bacteriosis. A discussion is given of allied fungi, of conditions favorable to spread of this disease, of varieties of mulberry found to be resistant thereto, and of preventive or remedial measures, as sulphate of copper and Bordeaux mixture. A brief bibliography is appended.

Further studies on the pecan rust, F. V. RAND (*Abs. in Science, n. ser., 35 (1912), No. 913, p. 1004*).—In a preliminary report (E. S. R., 26, p. 56) the author described the fungus causing the leaf disease of pecans as *Mycosphærella convexula*. Since that time additional studies have been made, and in the course of 1½ years' growth in cultures strains originally producing a majority of apparently two-celled ascospores have changed until now most of the ascospores are distinctly nonseptate. Furthermore, a typical Glœosporium form has developed in culture and has also been obtained from the host. Inoculations with cultures which originated from single ascospores made on Jonathan and Yellow Newton apples gave a decay similar to the bitter rot, with the production of conidia and immature perithecia on the latter.

From the studies thus far made it appears that the fungus is closely related to if not identical with *Glomerella rufomaculans*, and that it is not a very active parasite on the pecan.

A bacterial disease of Aster chinensis, G. L. PAVARINO (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 21 (1912), I, No. 8, pp. 544–546*).—The author describes a disease of asters due to *Bacillus asteraceæarum* n. sp.

The leaves seem to be first attacked, and the disease spreads from the lower to the upper part of the plant, discoloring the leaves, which finally become brown and dried. A technical description of the organism is given.

Notes on winterkilling of forest trees, C. P. HARTLEY (*Forest Club Ann. [Univ. Nebr.], 4 (1912), pp. 39–50*).—The author gives an account of observations made in District 2 of the United States Forest Service of injuries to trees, the different types of which are grouped under the general term of winterkilling. Particular attention is paid to the injury which occurred in the Black Hills Forest in 1909 during one of the chinook periods, or at the time when an unusual rise in temperature was followed by a very sudden and decided fall.

A new leaf disease of the white alder, F. W. NEGER (*Naturw. Ztschr. Forst u. Landw., 10 (1912), No. 6, pp. 345–350, figs. 2*).—An account is given of a leaf spot disease of *Alnus incana* in Norway. The fungus causing it does not seem to be identical with any known species, and it is provisionally described as *Gnomoniella albomaculans* n. sp.

The chestnut bark disease, W. H. RANKIN (*Abs. in Phytopathology, 2 (1912), No. 2, p. 99*).—A study of specimens of the mature perithecial stage of the fungus showed the perithecia dehiscing under moist conditions throughout the summer. The conidial stage of the fungus, differing from the usual pycnidia, was found commonly developing on the wood. The sap wood was said to be markedly affected and the leaves killed through a toxic effect. The author claims there is evidence that the relative water and air content of the tree determines its susceptibility to the fungus.

The oak mildew, E. GRIFFON and A. MAUBLANC (*Bul. Trimest. Soc. Mycol. France, 28 (1912), No. 1, pp. 88–104, pls. 3*).—The results are given of a series of investigations on the different powdery mildews occurring on the oak, the authors concluding that the American species of Microsphæra on the oak are *M. abbreviata* and *M. extensa*, and that they are both distinct from *M. alni* of Europe. The species occurring on the oak in Europe is said not to be identical with any of the American species, but is probably an introduced one of unknown origin, and the authors propose for it the name *M. alphitoides*.

The Hendersonia disease of Eucalyptus globulus, A. R. DAVIS (*Pomona Col. Jour. Econ. Bot., 2 (1912), No. 1, pp. 249–251, figs. 2*).—The author describes *H. eucalypticola*, an apparently undescribed species occurring on the leaves of eucalyptus in southern California. The fungus was apparently distributed over quite an area, but the actual damage being done by it at present seems to be slight. Its attacks seemed to be confined exclusively to the young broad leaves, the slender longer leaves being, so far as the author has observed, immune to attack.

Two fungus diseases of coniferous trees, J. FISHER (*Agr. Jour. Union So. Africa, 3 (1912), No. 3, pp. 389–391, figs. 2*).—Two leaf cast diseases are reported at the Central Experiment Farm, Natal as killing terminal and lateral shoots and in some instances trees. One of these diseases said to be due to *Diplodia pinea*, is supposed to be confined to the genus Pinus. The other, ascribed to *Pestalozzia funerea*, is reported on *Pinus pinaster*, *P. canariensis*, *P. longifolia*, *P. insignis*, *P. massoniana*, *Cupressus lusitanica*, *C. lawsoniana*, *Casuarina leptoclada* and possibly on *Callitris australis*. Wounds made by hail or in handling and wet weather favor the development of the disease. Protective measures suggested include removal and burning of infected or suspected parts, avoidance of diseased ground in planting susceptible trees, and care in selecting nursery stock and handling young trees.

The superficial tension and wetting power of insecticides and fungicides, and means for increasing their wetting power, V. VERMOREL and E. DANTONY (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 20, pp. 1300–1302; reprint,*

pp. 4; Prog. Agr. et Vit. (Ed. l'Est-Centre), 33 (1912), No. 20, pp. 613–615; Jour. Agr. Prat., n. ser., 23 (1912), No. 21, pp. 665, 666).—The authors have studied various means of augmenting the efficiency of fungicides and insecticides by increasing their wetting power. Saponin, soap, castor oil, and gelatin were added to the mixtures, and their covering power determined.

The authors conclude that the wetting power of the solution, so far as it relates to plants, depends upon the facility with which the solution forms liquid films and the resistance of these films to superficial tension. The determined wetting power of a solution for one plant or plant organ does not necessarily imply that it will have the same ability to wet other bodies or other organs.

In the authors' experiments the best results were obtained with gelatin added at the rate of from 10 to 50 gm. per hectoliter of fungicide. This proved much better and cheaper than any of the other substances tested. All forms of gelatin are thought not equally desirable, especially when used with Bordeaux mixture and Burgundy mixture. This matter is to be given further study.

A modified copper acetate fungicide is recommended, made by the following formula: Water 100 liters, neutral copper acetate 1 kg., and gelatin from 10 to 20 gm. The copper acetate is dissolved in 100 liters of water, and the gelatin is dissolved in hot water, after which the solution containing the gelatin is poured into the copper solution, thoroughly stirred, and applied.

In the reprint it is claimed that practically all forms of gelatin are equally adapted to use in connection with the above formula.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Report of an expedition to Laysan Island in 1911, under the joint auspices of the United States Department of Agriculture and the University of Iowa (*U. S. Dept. Agr., Bur. Biol. Survey Bul. 42, pp. 30, pls. 9, fig. 1*).—This report consists of 2 parts.

Report on conditions on the Hawaiian bird reservation with list of the birds found on Laysan, H. R. Dill (pp. 7–23).—This is a report of an expedition sent to Laysan, the largest and most important island of the Hawaian Islands Reservation, to ascertain the present condition of the bird rookeries and to collect a series of birds for a museum exhibit. A period of about 2 months during April, May, and June was spent upon the island. A brief description is first given of the Hawaiian Islands Reservation, with notes on seals, introduced rabbits and guinea pigs, insect pests, and birds as seed carriers. Then follows a brief narrative of the expedition and an extended annotated list of birds of Laysan, together with an island bird census.

Report on conditions on Laysan, with recommendations for protecting the Hawaiian Islands Reservation, W. A. Bryan (pp. 24–30).—This report consists of a comparison of conditions in 1903 and 1911 and recommendations for the future protection of the reservation.

Our mid-Pacific bird reservation, H. W. Henshaw (*U. S. Dept. Agr. Yearbook 1911, pp. 155–164, pls. 2, figs. 2*).—This paper is largely based on the above noted bulletin.

Handbook of birds of eastern North America, F. M. Chapman (*New York and London, 1912, rev. ed., pp. XXIX+530, pls. 24, figs. 136*).—Much of this revised edition is said to have been rewritten. The nomenclature is that of the 1910 edition of the A. O. U. Check List.

Michigan bird life, W. B. Barrows (*Michigan Agr. Col. Spec. Bul., 1912, pp. XIV+822, pls. 70, figs. 152*).—A list of all the birds (336 species and subspecies) known to occur in Michigan, together with an account of the life history of each species and special reference to its relation to agriculture.

A hypothetical list, which includes species that have been attributed to Michigan but whose status is doubtful; a list of books, papers, and short notes relating mainly or entirely to Michigan birds; a glossary of the technical terms used in keys and descriptions; an outline of classification of North American birds; and a list of contributors, are presented in appendixes.

Hungarian partridge and pheasants in Missouri, J. A. TOLERTON (*Dept. Game and Fish [Missouri], Bul. 1, 1911, pp. 100, pls. 2*).—This bulletin consists largely of reports received from correspondents relating to the experimental raising of Chinese pheasants and Hungarian partridges in Missouri.

Studies in bird migration, W. E. CLARKE (*London, 1912, vols. 1, pp. XVI+323, pls. 9; 2, pp. VII+346, pls. 16, fig. 1*).—These studies are said to be the results of many years' personal observations and researches, during which exceptional opportunities for acquiring special knowledge of the subject were afforded the author.

The food of birds, LAURA FLORENCE (*Trans. Highland and Agr. Soc. Scot., 5. ser., 24 (1912), pp. 180–219*).—In this paper the author presents details of a year's investigations of the food of 616 birds, representing 73 species. The majority of the birds examined were shot while feeding on agricultural land, and the specimens were obtained chiefly in the northeastern counties of Scotland, although a small number sent from the southern counties and England have been included.

"During a week of severe frost in February (1910) a number of starlings were examined, and in almost every case the food consisted of corn, seeds, and fruits of weeds and wild plants. All the seeds, with the exception of the corn, were found in every part of the intestine in perfect condition, consequently providing no sustenance for the birds, who were thus acting as distributors of the seeds."

Bird protection with particular consideration of the insect eating birds, G. RÖRIG (*Flugschr. Deut. Landw. Gesell., 1910, No. 11, pp. 46, figs. 15*).—This paper deals largely with the practical methods of fostering and protecting beneficial birds.

Notes on the bionomics of rats and ground squirrels, G. W. MCCOY (*Pub. Health and Mar. Hosp. Serv. U. S., Pub. Health Rpts., 27 (1912), No. 27, pp. 1068–1072*).—The notes here presented are based on observations made in connection with the eradication work conducted in California. They relate to breeding and raising in captivity, life in captivity, breeding seasons, foods, and the starvation of rats.

Comparative investigations of the action of bacterial and chemical rat destroying preparations, AUMANN (*Centbl. Bakt. [etc.], 1. Abt., Orig., 63 (1912), No. 2–3, pp. 212–221, figs. 2*).—In observations and experiments extending from 1905 to 1910 in which 30 preparations were employed, the best results followed the use of phosphorus (from 96 to 100 per cent mortality) and squill (from 60 to 75 per cent mortality) preparations. With bacterial preparations only unsatisfactory results (20 to 33⅓ per cent mortality) were obtained.

The rat guard used in the Philippine Islands, C. FOX (*Pub. Health and Mar. Hosp. Serv. U. S., Pub. Health Rpts., 27 (1912), No. 23, pp. 907, 908, figs. 2*).—A rat guard for ships' lines is described and illustrated.

Crawfish as crop destroyers, A. K. FISHER (*U. S. Dept. Agr. Yearbook 1911, pp. 321–324, pl. 1*).—Although crawfish have heretofore been generally supposed to be of little agricultural importance, it has been found that in the Houston clay lands in Mississippi and Alabama, there are areas estimated at not less than 1,000 square miles infested by crawfish on which it is almost impossible to raise any crops with profit. The formation they inhabit is a

heavy gumbo soil from 4 to 15 ft. in depth, well saturated with water, and overlying a sandstone formation.

The crawfish "do the greatest amount of damage just after the plant appears and before secondary leaves are developed. Large fields of young cotton have been destroyed in a single night. Corn also is extensively eaten, but is not so badly damaged as cotton." It is stated that in badly infested areas there are from 8,000 to 12,000 holes to the acre; on one plantation 27 bbls. of crawfish were picked up in a season, and the following year 13 bbls. more were secured.

Very little is known regarding the breeding habits of this injurious species. "The number of young is variable, but usually increases with the age of the mother, so that females which at first have only from 50 to 100 eggs, may later in life produce 400 eggs or more at a time. The development of the eggs requires about a month, and the young remain with their mother for from one to two weeks before starting an independent life. They grow rapidly during the first summer, molting about once a month, until they attain in fall, or beginning of cold weather, a length of approximately 2 in. Crawfish are solitary in habits, and 2 are rarely found in one burrow, except during the mating season or when females are accompanied by young."

Repressive measures include deep tile draining, the collection and crushing of crawfish, and the use of poison. In experiments with carbon bisulphid, chlorid of lime, and calcium carbid, it was found that carbon bisulphid gives the best results. The most practical and economical means of coping with the crawfish problem is to kill as many as possible by mechanical means before seeding, and to treat the remaining occupied burrows with poison, preferably carbon bisulphid.

Handbook of pathogenic protozoa, edited by S. von Prowazek (*Handbuch der Pathogenen Protozoen. Leipsic, 1912, pt. 4, pp. 361–515+VII, pls. 7, figs. 36*).—In this fourth part, which completes volume 1, *Treponema pallidum* is dealt with by P. Mühlens (pp. 361–486); and The Gregarines, by C. Schellack (pp. 487–515). Bibliographic lists accompany both papers.

Bibliography of Canadian zoology for 1910, L. M. Lambe (*Proc. and Trans. Roy. Soc. Canada, 3. ser., 5 (1911), Sect. IV, pp. 155–163*).—Eighty-two titles are listed in this bibliography.

Bibliography of Canadian entomology for the year 1910, C. J. S. Bethune (*Proc. and Trans. Roy. Soc. Canada, 3. ser., 5 (1911), Sect. IV, pp. 165–176*).—One hundred and sixteen titles are listed in this bibliography.

The entomological code: A code of nomenclature for use in entomology (*Washington, D. C., 1912, pp. 31*).—The code here presented was compiled by N. Banks and A. N. Caudell for the purpose of aiding entomologists in deciding questions of nomenclature arising in their work. In its preparation, the various codes of nomenclature were frequently consulted and used, various published articles on nomenclature were referred to, and a preliminary draft was submitted to many of the principal systematic entomologists of America, and their opinions given consideration. It is pointed out that existing codes fail to cover many points which continually arise in entomological work, or the language used is of such a broad or indefinite scope as to require official interpretation to make the meaning evident; that scarcely an entomologist has been connected with the preparation of the larger codes; and that the codes prepared by entomologists have been of restricted scope or made with certain questions in view.

A manual of injurious insects, W. B. Collinge (*Birmingham, Eng., 1912, pp. XX+268, figs. 105*).—This work has been prepared with a view to directing the attention of farmers, fruit growers, horticulturists, and others to the life

histories of a few of the commoner injurious insects, and to the importance of a full appreciation of the methods of controlling them, particularly so as regards cultural methods. It is stated that the life history of nearly every insect mentioned has been carefully worked out by the author and that the text is largely compiled from his writings or is based on observations made during an experience of many years. Instructions for using hydrocyanic-acid gas and bisulphid of carbon, an account of the black-currant gall-mite, and a list of plants with injurious insects are presented in appendixes.

The brains of insects, H. E. ZIEGLER (*Naturw. Wchnschr., 27 (1912), No. 28, pp. 433–442, figs. 18*).—An illustrated account of studies of the brains of insects.

Report of the state entomologist, T. B. SYMONS (*Rpt. Md. State Hort. Soc., 13 (1910), pp. 96–112*).—This report includes brief statements of the work of the year 1910, including inspection of imported trees and plants, work with the terrapin scale (E. S. R., 24, p. 658), orchard inspection, San José scale, nursery inspection, public spraying, etc.

Report of the state entomologist, T. B. SYMONS (*Rpt. Md. State Hort. Soc., 14 (1911), pp. 165–174*).—A brief statement is given of the work of the year 1911, including nursery inspection, experimental work, public spraying demonstration, etc.

Insect pests of the Lesser Antilles, H. A. BALLOU (*Imp. Dept. Agr. West Indies Pamphlet 71, 1912, pp. IX+210, figs. 185*).—As the author states, the object of this handbook is to present in plain and simple language a brief general account of the present knowledge of some of the principal insect and mite pests of the crops grown in the Lesser Antilles, also of the pests attacking man and domestic animals, and those of the household.

Annual report for 1911 of the zoologist, C. WARBURTON (*Jour. Roy. Agr. Soc. England, 72 (1911), pp. 381–387*).—A brief report is given of the occurrence during the year of insect enemies of forest trees, corn, grass, general farm and garden crops, and fruit.

Insect pests in 1911, R. S. MACDOUGALL (*Trans. Highland and Agr. Soc. Scot., 5. ser., 24 (1912), pp. 120–138, figs. 6*).—The insects here considered include the large larch sawfly (*Nematus erichsoni*); *Strophosomus coryli*, a weevil which at times injures young conifers, etc.; a tineid (*Œcophora sulphurella*) attacking beech and oak; *Pemphigus bursarius*, which forms galls on the leaf stalks of poplar; the common rustic moth, *Apamea* (*Hadena*) *didyma* (*oculea*), which attacks grain crops; the chrysanthemum leaf mining fly (*Phytomyza geniculata* (*horticola*)); the brown spotted pinion (*Orthosia litura*), found feeding on the leaves of cereals; and 2 dipterous enemies of cereals, namely, the frit fly (*Oscinis frit*) and the wheat bulb fly (*Hylemyia coarctata*).

Report of the entomologist and vegetable pathologist, H. TRYON (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1910–11, pp. 70–79*).—This report includes a brief account of the occurrence of insect pests, ticks, etc., and the work therewith during the year 1910–11.

Report of the entomological branch, L. J. NEWMAN (*Dept. Agr. and Indus. West. Aust. Ann. Rpt. 1911, pp. 29–31*).—This report consists of accounts of the occurrence of the more important insect enemies of the year.

Papers on cereal and forage insects (*U. S. Dept. Agr., Bur. Ent. Bul. 95, pt. 6, pp. 98–108, pl. 1, figs. 17*).—This part consists of 2 papers.

The legume pod moth (*Etiella zinckenella schisticolor*), J. A. Hyslop (pp. 89–104).—The first mention of the legume pod moth as of economic importance in the United States was found by the author in unpublished notes of T. Pergande in the files of the Bureau of Entomology and refers to injury caused to Lima bean pods collected by A. Koebele in Eldorado County, Cal., in July, 1885. Since that time it has been recorded as feeding on the seeds of several species of leguminous plants, including the common rattlebox (*Crotolaria sagittalis*), at

Stillwater, Okla., *C. incana* at Cocoanut Grove, Fla., and the seed pods of milk vetch (*Astragalus* sp.). The author has reared the species from pods of the common lupines (*Lupinus* spp.) and Canada field peas at Pullman, Wash.

Technical descriptions given of the stages are followed by accounts of its seasonal history and of field work. A newly emerged larva was first found by the author at Pullman, Wash., on July 26, 1911. The larvæ feed for about 3 weeks, only partly consuming the peas, but destroying them as seed and greatly reducing their weight as stock feed. The pod always contains a mass of frass held together by a loosely constructed web. When mature, if the peas are still unharvested in the field, the larva emerges from the pods and enters the ground to pupate, or if the pods have been harvested it spins a tough silken cocoon in the nearest available sheltered place.

"Larvæ that become mature during the warm weather of early August, out of doors, or later under laboratory conditions, pupate immediately and emerge as adults in about 6 weeks. Adults have been obtained in our laboratory on August 5 and as late as August 28. Whether these lay eggs which pass the winter successfully, or whether they hibernate as adults, is still undetermined. Larvæ that reach maturity in late September, when the nights are cold, spin their cocoons and hibernate therein as larvæ, pupating in the spring and emerging at the time the earliest lupines are setting seed.

"On the lupines there are very probably 2 generations a year. The moths of the first generation, coming from hibernating larvæ, lay all their eggs on the lupines, as the field peas are just commencing to grow. The offspring of this generation mature late in July and, finding the field peas ripening, very naturally turn their attention to these large areas of suitable food as well as to their natural food, the later lupines." In investigations made in 1910 of more than 100 varieties of field peas at Pullman, Wash., it was found that the varieties which began blooming during and after the last week in June were decidedly the most severely attacked. In investigations of 67 varieties in 1911 it was found that those in full bloom prior to June 28 were practically unmolested.

The author's observations indicate that this insect can very easily be introduced into regions where it does not at present occur by being shipped with the seed field peas, it having been found in sacks of seed peas.

Two hymenopterous parasites were reared from the larvæ at Pullman, Wash., namely, *Pseudapanteles etiellæ* and *Microbracon hyslopi*. Two other species are recorded as having been reared.

"The legume pod moth is readily controlled by preventive measures. . . . The transportation of the hibernating forms in sacks of seed, and the consequent dissemination of the pest, may be prevented by fumigation of the seed with carbon bisulphid. Owing to the presence of the native lupines, extermination of the pest is impossible, but by planting such early varieties of field peas as come into full-bloom before the last week in June it may be practically eliminated as a factor to be dealt with in seed growing in the Pacific Northwest. The date of planting, however, will vary in different localities and under different conditions."

The legume pod maggot (*Pegomya planipalpis*), J. A. Hyslop (pp. 105–108).—In investigations of 1910 it was found that *P. planipalpis* is quite capable of independently infesting seed pods and that it is actually a seed destroyer. Many pods were found to contain from 1 to 3 of its larvæ. This insect has been previously reported as attacking radishes at San Francisco, Cal. In cages with earth in the bottom the pupæ were always to be found below the surface at distances ranging from 1 to 3 in. Technical descriptions are given of its stages.

Two chalcidid parasites, *Holaspis* n. sp., and an undetermined form, have been reared from the legume pod maggot. This maggot has not as yet become a

serious factor in field-pea seed growing in the Pacific Northwest. "The dissemination as hibernating puparia can be readily prevented by fumigation. As is the case with the legume pod moth, it can not be exterminated because of the native lupines.

Some insect pests of maize, R. W. JACK (*Rhodesia Agr. Jour., 9 (1912), No. 5, pp. 707–716, pls. 4*).—A brief account is given of the injury caused by some of the more important insect enemies of corn in Rhodesia.

[The cotton worm and the Mexican cotton boll weevil], W. E. HINDS (*Alabama Col. Sta. Rpt. 1911, pp. 22–24*).—Careful examinations made in the field showed that the cotton worm actually decreased the Alabama cotton crop of 1911 by approximately 10 per cent.

"The advance of the boll weevil began during the latter part of August, 1911, and continued until about the middle of November when frost killed the cotton. The infested area then included all or part of 12 counties in Alabama, the weevil line extending in a general southeasterly direction from near the northeast of Pickens County to the middle of Escambia County. . . . The area now infested by the weevil should produce about 10 per cent of the normal Alabama crop."

Relation between rotation systems and insect injury in the South, W. D. HUNTER (*U. S. Dept. Agr. Yearbook 1911, pp. 201–210*).—This article points out some of the general considerations that must be taken into account in connection with rotation practices which are coming to be generally followed in the southern United States. Examples are given of simple means of reducing insect injury by modifications of rotation systems.

Pests and diseases, W. N. SANDS (*Imp. Dept. Agr. West Indies, Rpts. Bot. Sta. [etc.], St. Vincent, 1910–11, pp. 14, 15*).—A brief report is given of the occurrence during the year of some of the more important insect enemies of cotton.

Parasites of insects attacking sugar cane, R. C. L. PERKINS (*Hawaiian Sugar Planters' Sta. Ent. Bul. 10, pp. 5–27*).—In this bulletin the author describes 19 new species and 1 new variety of chalcidoid parasites, nearly all of which were bred from eggs of insects attacking cane in countries other than the Hawaiian Islands. The American species were obtained by Koebele while investigating insects in the cane fields in Mexico during the winter months of 1908. All the rest were obtained by Muir in Fiji, China, and the Malay Islands. Three genera, namely, Neotetrastichus, Jassidophthora, and Eomymar, are characterized for the first time.

Elm-leaf beetle and white-marked tussock moth, E. P. FELT (*N. Y. State Ed. Dept. Bul. 511, 1912, pp. 35, pls. 8*).—This bulletin, which is a revision of New York State Museum Bulletin 109, previously noted (E. S. R., 19, p. 355), presents popular accounts of these 2 shade-tree enemies.

Forest entomology, A. T. GILLANDERS (*Edinburgh and London, 1912, 2. ed., pp. XXIV+428, figs. 354*).—In this second edition (E. S. R., 20, p. 652) the chapters have been rearranged more in accordance with the sequence of entomological classification.

Insect damage to mine props and methods of preventing the injury, T. E. SNYDER (*U. S. Dept. Agr., Bur. Ent. Circ. 156, pp. 4*).—This circular, based on special investigations in cooperation with mining companies, gives preliminary information on the principal types of insect injury and shows how a large percentage of injury can be prevented.

"By barking and seasoning mine timbers, insect injury before placement will not only be prevented, but injury by termites after placement will also be delayed or under some conditions even prevented and the length of life of the

timbers prolonged. . . . Impregnating props intended for permanent service with creosote by some standard process (either by the 'open-tank' or by the cylinder-pressure processes) will keep out termites and other wood-boring insects and preserve the props for a much longer period than they would last untreated."

See also previous notes (E. S. R., 24, p. 256; 27, p. 443).

A contribution to the study of the lucifuge termite, J. Feytaud (*Arch. Anat. Micros., 13 (1912), No. 4, pp. 481–607, pls. 3, figs. 34*).—This paper deals with the anatomy and histology of, and the foundation of new colonies by, *Leucotermes* (*Termes*) *lucifugus*. A bibliography is appended.

The greenhouse thrips (Heliothrips hæmorrhoidalis), H. M. Russell (*U. S. Dept. Agr., Bur. Ent. Circ. 151, pp. 9, figs. 7*).—This circular is based on the paper previously noted (E. S. R., 21, p. 559).

Spraying for the orange thrips, A. W. Morrill (*Arizona Sta. Rpt. 1911, pp. 552–554*).—It was found that lime-sulphur solution alone, at the rate of 1 part to 85 parts of water, was as effective as when tobacco extract was added.

Note on a trypanosome from Conorhinus rubrofasciatus and its inoculation into the rat and mouse, A. Lafont (*Compt. Rend. Soc. Biol. [Paris], 72 (1912), No. 9, pp. 380–382; abs. in Sleeping Sickness Bur. [London], Bul., 4 (1912), No. 36, pp. 140, 141*).—Flagellates were found by the author in the alimentary tract of 80 per cent of the reduviid *C. rubrofasciatus* captured in the island of Mauritius and of 50 per cent of those taken in the island of Réunion. A series of forms between leptomonas and trypanosome types was found, the first named being rare. The name *Trypanosoma boylei* has been given to the trypanosome form, inoculation experiments with which are briefly reported. The author points to the possible pathogenic rôle of this trypanosome for man.

Elm-leaf curl and woolly aphid of the apple, Edith M. Patch (*Science, n. ser., 36 (1912), No. 914, pp. 30, 31*).—Spring migrants of *Schizoneura americana*, which causes the elm-leaf curl, having been observed to desert the elm leaves in the early summer, and fall migrants of *S. lanigera* (the woolly aphis of the apple) to leave the apple branches in the fall, the author conducted investigations to determine a possible relationship.

In the spring of 1912 elm-leaf curl was obtained from the South and the emerging winged forms were caged over apple seedlings in the greenhouse while depositing their young. "As a result, the progeny, a fine lot of nymphs that are growing along creases where the thin bark is scaling back, in the axils of the leaves, and on exposed roots of the apple seedlings, covered by a typical flocculent white secretion, would be pronounced 'woolly aphid of the apple' by any nursery inspector." It is pointed out that if the American species on elm is the same as the European species, the name of our orchard pest, the woolly aphis, will revert to *S. ulmi*.

Papers on deciduous fruit insects and insecticides.—The grape scale (Aspidiotus [Diaspidiotus] uvæ), J. F. Zimmer (*U. S. Dept. Agr., Bur. Ent. Bul. 97, pt. 7, pp. 115–124, pls. 3, figs. 2*).—The grape scale has been reported to be more or less destructive to grape vines during the last 3 decades. In addition to the grape it occurs to a very limited extent on certain forest and shade trees.

Notes of the Bureau of Entomology record the receipt of this scale from T. Pergande at St. Louis as early as 1875. It has since been found to be rather widely distributed in the eastern United States, occurring from Florida north to New Jersey. It is known to occur in Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Illinois, Indiana, Kansas, Kentucky, Maryland, Mississippi, Missouri, New Jersey, North Carolina, Ohio, Tennessee,

Virginia, and West Virginia, many parts of Europe, Brazil, Jamaica, and the West Indies.

It appears to have many habits similar to those of the San José scale. When abundant the grape scale very materially retards the development of the vines and always infests the second year's growth. The author's observations show the species to be viviparous with but a single brood each year. The female insect gives birth to from 35 to 50 living young during the months of May and June. After an active stage of about 2 days the young settle down on the cane and there is a fairly uniform development. Technical descriptions of the male and female and of their scales, prepared by E. R. Sasscer, are presented.

In an examination made of female scales on May 20, 1911, the author found about 80 per cent to be parasitized, the parasites including *Ablerus clisiocampæ*, *Ablerus* n. sp., *Physcus varicornis*, *Physcus* sp., *Azotus marchali*, *Coccophagus* n. sp., and *Aphelinus fuscipennis*. *Controdora* sp., *Prospaltella murtfeldtii*, and *Signiphora pulchra* have also been reared by the author, and a mite of the genus Tyroglyphus has been recorded.

Lime-sulphur is recommended for winter use, but whale-oil soap solution, kerosene, or crude petroleum emulsion, etc., may be used. When it is desired to treat the grape scale during the period of foliage of the vines, the use of whale-oil soap at the rate of 1 lb. to 3 or 4 gal. of water, or of 10 to 12 per cent kerosene emulsion may be advisable. A second and sometimes a third application is said to be advisable on account of the habit of the young in settling under the shreds of dead bark.

A bibliography is appended.

Diaspis pentagona in Argentina, J. M. Huergo (*Trab. 4. Cong. Cient. Santiago de Chile, 16 (1908–9), pp. 450–478, pls. 22*).—This is a discussion of the occurrence, life history, natural enemies of and injuries caused by the West Indian peach scale in Argentina, with remedial measures therefor.

Diaspis pentagona in the Province of Buenos Aires, T. Amadeo (*Rev. Mens. Cám. Merc., 12 (1912), No. 117, pp. 27–35*).—A brief account of the West Indian peach scale (*Aulacaspis* [*Diaspis*] *pentagona*), and remedial measures therefor.

The cotton worm or cotton caterpillar (Alabama argillacea), W. D. Hunter (*U. S. Dept. Agr., Bur. Ent. Circ. 153, pp. 10, fig. 1*).—For 21 years prior to 1911 the cotton worm had not been generally abundant in the United States, although there was local damage of some severity during different years in that period. "The outbreak of 1911 did not originate in the United States, but in Central or South America. The moths flew northward very early in the season and reached the neighborhood of Brownsville, in Texas, by April. By the middle of June practically all of the cotton fields in the vicinity of Brownsville that had not been protected by the use of poisons had become defoliated. The new generations of the insects flew northward and eastward during June and July. During the latter month there appears also to have been another invasion of the United States from South America. This reinvasion took the moths into the South Atlantic States, where they were soon found in very great numbers. They bred with great rapidity and spread northward and westward. In August the western and eastern invasions coalesced, and within a few weeks the insects were numerous in cotton fields throughout the belt. . . .

"The cotton moth is of South American origin and does not survive the winters in the United States, except when the temperatures are above the normal or when individuals obtain unusual shelter." Whether there would be an outbreak in 1912 is thought to depend upon (1) the survival of the winter by moths in this country and (2) a new invasion from South America. In

careful searches for the moths made in favorable localities in the southern part of the cotton belt during the past winter and extending from Brownsville, Tex., to South Carolina, no live moths were found. Chrysalids of the moth placed in rearing cages at Victoria, Tex., in the fall of 1911 were all killed by cold by the end of January. Thus all the information obtainable led to the conclusion that an outbreak in 1912 would be dependent upon a reinvasion of the United States from some southern locality.

"For the control of the cotton worm the use of powdered arsenate of lead at the rate of 2 lbs. per acre is advised above all other means. This substance does not need to be mixed with any other material. Paris green, if used, should be mixed with lime and flour as described."

Descriptions of the stages of the cotton moth are included.

The evergreen bagworm, L. HASEMAN (*Missouri Sta. Bul. 104, pp. 309–330, figs. 16*).—The general distribution over the State, its wide selection of food plants, and the destructive nature of its work has led the author to consider the bagworm as probably the most troublesome insect pest attacking the foliage of trees in Missouri at the present time. While it has always been more or less destructive to evergreens, during the last few years it has become extremely destructive to many deciduous trees and shrubs and other plants. Large areas of bearing orchards are said to have been destroyed, seemingly by one defoliation. Although primarily a foliage pest, it has been known to feed upon developing fruit.

The original home of this native insect was in the South, where it is still most abundant. In its gradual northward spread, it has tended to follow river courses and the coast, this following of river courses being especially noticeable in its distribution in Missouri. "The pest is most abundant and destructive in the western half of the State, especially in the southwestern counties and along the courses of the Missouri and Osage rivers. In St. Joseph, Kansas City, and St. Louis it is extremely troublesome upon shade and ornamental trees. Throughout most of the northeastern and southeastern portions of the State it does little damage except in restricted regions. It is most abundant in cities and low bottom lands. In the cities its natural enemies are less numerous and the food supply is readily accessible, while in the bottom lands such food plants as willows grow in great profusion and the streams assist in its distribution. From the bottom lands it gradually migrates to the uplands, where it feeds largely upon ornamental, shade, and fruit trees." Over most of the area in which the bagworm is found, it appears in sudden outbreaks, being destructive for a year or two and then decreasing as its enemies gain the upper hand. In the orchard it is especially destructive to apple and plum, although it is found on the cherry, pear, quince, and peach. In the absence of its choice food plants, it will feed freely upon clover, ragweed, parsley, surge, and nightshade.

Studies made of its life history and habits are reported. The winter is passed in the egg stage inside the female bags. In the latitude of central Missouri the second week in May is the normal time for the first appearance of the larvæ outdoors. There is a great variation in the rate of its growth, it being not uncommon to find newly hatched, half-grown, and full-grown caterpillars on the same tree and frequently some caterpillars will be found full-grown before others of the same brood are half-grown. Although it has previously been reported to pass through 4 larval stages, the author's observations indicate that there are 5, the additional 1 coming soon after hatching. In observations of a colony the author found the first adult males to appear from August 15 to 20, and to be quite abundant and mating from September 5 to 12. Two weeks later the bags were found filled with eggs.

Three species of ichneumons (*Pimpla inquisitor*, *P. conquisitor*, and *Allocota thyridopterigis*) are found commonly parasitizing the bagworm. The various small parasites reared from the bagworm from various parts of the State include *Habrocytus thyridopterigis*, which is most abundant; *Dibrachys bouchcanus*, which is also common; and *Pteromalus* sp., *Tetrastichus* sp., and *Phobetes albinopennis*, which are less abundant. Limited observations led the author to consider ants an important check upon the young caterpillars. Birds were found to be important enemies.

Control measures consist (1) of the collection of the bags and (2) of the application of an arsenical. When collected all the female bags containing eggs should be placed in a box or barrel far from trees or shrubs, since this will render it impossible for the young caterpillars upon hatching to find their way to trees and at the same time prevent the destruction of beneficial parasites.

"As the result of experimental tests of the effect of poison upon bagworms of different ages, the writer finds that the very young caterpillars readily feed upon poisoned foliage and quickly succumb. The older caterpillars are more cautious about feeding upon sprayed foliage. From this it is evident that early spraying is desirable, for it not only proves more effective but also destroys the pest before the foliage is consumed. Arsenate of lead should be used, especially upon evergreens, since it sticks better and is less apt to burn the foliage. If the spraying can be done while the caterpillars are yet small, 2½ lbs. of arsenate of lead to 50 gal. of water is sufficient. When later spraying is done to control the older caterpillars it is advisable to use from 3 to 5 lbs. to 50 gal. of water, though at the latter strength slight burning may occur on evergreens. The first regular application of poison for the codling moth just after the blossoms fall will control the bagworm in orchards. One careful application of poison before the first of June will completely control the pest either upon fruit, evergreen, or shade trees."

The fostering and protection of birds is recommended.

Butterfly hunting in many lands, G. B. Longstaff (*London, New York, Bombay, and Calcutta, 1912, pp. XVIII+728, pls. 16*).—This work deals with the occurrence, bionomics, etc., of various Lepidoptera and other insects, based upon observations made in Asia, Africa, New Zealand, Australia, North America, South America, and the West Indies. A series of papers by F. Müller dealing with the scent organs, etc., of Lepidoptera, translated from the German and Portuguese by E. A. Elliott, are presented in appendixes.

The brown-tail moth in New Brunswick, W. McIntosh (*Rpt. Agr. New Brunswick, 1911, pp. 232–236, pl. 1*).—A brief account is given of the work of combating in New Brunswick the brown-tail moth, an egg cluster of which was first found at Old Ridge near St. Stephen in the summer of 1910. An account of preventive work conducted in New Brunswick is appended.

The grapevine scrawler or writer (Bromius vitis), F. Picard (*Prog. Agr. et Vit. [Ed. l'Est Centre], 32 (1911), No. 23, pp. 705–709, pl. 1*).—A brief account of a chrysomelid beetle (*B. vitis*) which attacks the grape, its habits and injury, and remedial measures therefor. This beetle is said to reproduce parthenogenetically.

A new pest of cowpeas (*Agr. News [Barbados], 11 (1912), No. 267, p. 234*).—A lepidopterous insect which in October, 1911, caused a considerable amount of injury to cowpeas growing in a field near Bridgetown, Barbados, has been found by H. G. Dyar to represent a new genus and species, to which the name *Ballovia cistipennis* has been given. It is said that an insect causing similar injury to the horse bean (*Canavalia ensiformis*) occurs in St. Kitts, but up to the present time the adult has not been reared.

Kumblihulas attacking crops in Mysore (Amsacta albistriga), L. C. COLEMAN (*Dept. Agr. Mysore, Ent. Ser. Bul. 3, 1912, pp. 12, pl. 1*).—*A. albistriga* is said to be the most common of the hairy caterpillars attacking crops in Mysore.

Œceticus platensis ("Bicho de Cesto") and its destruction, J. M. HUERGO (*Bol. Min. Agr. [Buenos Aires], 13 (1911), No. 9, pp. 590–626, figs. 15; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 2, p. 586*).—In the larval stage this lepidopteron attacks a large variety of fruit, forest, garden, and forage plants, stripping them of leaves and at times injuring the fruit. Among its important enemies are the ichneumonids *Pimpla brasiliensis* and *P. tomyris;* the chalcidids *Tetrastichus platensis* and *Smicra bergi;* and the tachinid *Phorocera xanthura.*

Ways and habits of caterpillars, H. W. B. MOORE (*Timehri, Brit. Guiana, 3. ser., 2 (1912), No. 1, pp. 197–206*).—Among the habits of caterpillars which the author mentions are those of cannibalism among caterpillars of *Laphygma frugiperda, Callidryas eubule,* and *Euptoicta heyesia;* the feeding of several species upon eggshells from which they have emerged; devouring their molted skins, etc.

Bird enemies of the codling moth, W. L. MCATEE (*U. S. Dept. Agr. Yearbook 1911, pp. 237–246, pls. 2*).—In this paper the author reviews the evidence relating to the destruction of the codling moth by birds, both native and exotic, with references to the literature.

"Birds are recognized as the most effective natural enemies of the codling moth. In some localities they destroy from 66 to 85 per cent of the hibernating larvæ, and their work in large measure accounts for the small spring broods of the insect. . . . Thirty-six species of birds are known to prey upon the codling moth in the United States. These species belong to 13 families, of which the most important, so far as number of species on the list is concerned, are the woodpeckers, titmice, and sparrows. Especially valuable species are the downy woodpecker, Bullock oriole, black-headed grosbeak, and bush tit. At least 10 species of foreign birds have been recorded as enemies of the codling moth, and there has been considerable agitation for the introduction of one or more of them. The importation of foreign species is, however, notoriously dangerous, and if successful would result in crowding out native species probably of greater value."

Experiments on infection with flacherie through food, and the means of preventing its spread, A. MOZZICONACCI (*Monit. Soies, 1911, No. 2554; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 8–10, pp. 2253, 2254*).—The results of the author's investigations show that flacherie is very easily and surely transmitted by the absorption of dust from nurseries where the disease has existed. Dust kept in a bottle 12 years does not lose its virulent action. Lysoform appears to exert a greater destructive power than sericine on the organisms of flacherie and grasserie.

The mosquito plague of the Connecticut coast region and how to control it, W. E. BRITTON (*Connecticut State Sta. Bul. 173, pp. 3–14, pls. 4, figs. 2*).—"The mosquito plague of southern Connecticut is composed chiefly of 2 species of salt marsh mosquitoes—the brown salt marsh mosquito (*Culex cantator*) and the banded salt marsh mosquito (*C. sollicitans*), which breed in the brackish stagnant pools of the salt marshes and fly inland several miles in search of their food. . . .

"The rain barrel mosquito (*C. pipiens*) breeds in rain water barrels, tin cans, and other receptacles along the shore, and certain other species of Culex, as well as the malarial mosquito, Anopheles, may breed in the fresh water pools next to the highland, yet these are all local, fly only short distances and form

only a small part of the mosquito plague of the coast region. The salt-marsh region of Connecticut contains 34.79 square miles, or 22,264 acres, more than half of which has in past years been drained for salt-hay farming. During recent years the marshes have received little attention, the ditches have become filled and probably breed more mosquitoes than they did 30 or 40 years ago. . . .

"The cost of draining the Connecticut marshes will vary, but may be done by contract at from $5 to $10 per acre, and should not average more than $8. The entire salt-marsh area of Connecticut can be drained for less than $200,000.

"The increase in yield of salt-marsh hay will soon pay the cost of draining and may do so in a single season."

Notes on mosquito eradication, G. W. McCoy (*Pub. Health and Mar. Hosp. Serv. U. S., Pub. Health Rpts., 27 (1912), No. 26, pp. 1029–1034*).—The notes here presented are based upon the experience of a rather extensive antimosquito campaign undertaken in the city of Honolulu, Hawaii. The data relate to the distribution of different species of mosquitoes; antilarvæ agents and procedures employed; and methods of treating different breeding places.

Fly larvæ and rabies virus.—Lyssicide action and virus transmission, C. Fermi (*Centbl. Bakt. [etc.], 1. Abt., Orig., 61 (1911), No. 1–2, pp. 93–97*).—In a first series of experiments the author fed fly larvæ on the brains of rabies cases and then tested their virulence by emulsifying and injecting subcutaneously. In a second series a fixed virus and fly larvæ were rubbed into an emulsion and likewise injected subcutaneously. The results obtained indicate that the rabies virus can not be transmitted through fly larvæ.

It appears that the fly larvæ emulsion has an attenuating effect upon a fixed virus, either through its direct action upon the virus or through its indirect action upon the organism. It possesses no absolute lyssicidal power, since a virus mixed with fly larvæ emulsion is found to be virulent when administered subdurally.

Note on a venomous dipteron, Teresa Joan (*Bol. Min. Agr. [Buenos Aires], 14 (1912), No. 4, pp. 363–385, pl. 1, figs. 12*).—This paper describes *Melusina (Simulium) dinellii.*

The grain flies, with particular consideration of their economic importance and the dependence of their appearance on meteorological conditions, K. Strömer and R. Kleine (*Fühling's Landw. Ztg., 60 (1911), No. 20, pp. 682–703, figs. 3*).—The species here considered are *Hylemyia coarctata, Limnophora* sp., *Chlorops tæniopus, Oscinis frit, O. pusilla, Agromyza graminis,* and *Hydrellia griseola.*

The influence of frost on the development of different varieties of barley in the presence of the frit fly, N. Litvinov (*Trudy Bûro Prikl. Bot. (Bul. Angew. Bot.), 4 (1911), No. 11, pp. 541–551*).—This paper deals with the effect of frost on barley and the relation of such to injury by *Oscinis frit.*

The value of predaceous beetles in destroying insect pests, A. F. Burgess and C. W. Collins (*U. S. Dept. Agr. Yearbook 1911, pp. 453–466, pls. 6, figs. 6*).—This is a general discussion of the usefulness of predaceous beetles, including native lady beetles and native ground beetles, facts concerning the importation of several species of predaceous beetles, and a comparison of *Calosoma sycophanta,* an account of which has been previously noted (E. S. R., 26, p. 350) with native Calosoma.

Preliminary report on the alfalfa weevil, F. M. Webster (*U. S. Dept. Agr., Bur. Ent. Bul. 112, pp. 47, pls. 13, figs. 27*).—This is a report of investigations commenced April 1, 1910, and covering the work up to November 15, 1911, conducted in cooperation with the Utah Station (E. S. R., 24, p. 458; 25, p. 150).

"Up to September, 1911, the insect had extended its area of diffusion directly northward as far as Tremonton, east to Evanston, Almy, and Lyman, Wyo.,

and northeast to Cokeville, Wyo., Randolph and Laketown, Utah, and Fish Haven, Idaho."

While previously reported to be *Phytonomus murinus*, a further study has shown the pest to be *P. posticus*, a closely related insect, which is much more common and injurious to alfalfa in Europe, western Asia, and northern Africa, where it is generally known as *P. variabilis*. A much larger species, *Hypera punctata*, the clover-leaf weevil, has recently been collected at Malad, Idaho, and Ogden, Utah.

It has been found that the females do not always confine themselves to alfalfa stems in ovipositing, eggs having been discovered in the stems of the ground plum (*Astragalus arietinus*) and larvæ found feeding on *A. utahensis*. In 1910 oviposition was found to commence early in March and was at its height by the middle of May. Evidence was found of a partial second generation. In cage experiments it was found that in combination with alfalfa the larvæ fed freely on sweet pea, Utah milk vetch, string bean, obtuse-leaved vetch, narrow-leaved vetch, white clover, red clover, alsike clover, yellow sweet clover, white sweet clover, *Medicago lupulina*, *M. echinus*, *M. hispida nigra*, *M. hispida confinis*, *M. hispida terebellum*, *M. muricata*, *M. orbicularis*, *M. scutellata*, black locust, and fenugreek. When no other food was offered the larvæ fed upon *Hedysarum mackenzii*, *Astragalus oreophilus*, downy lupine, chick pea, *Vicia atropurpurea*, *V. dispema*, spring vetch, hairy or winter vetch, and spider plant, but these were refused when offered alfalfa.

Field experiments in destroying the weevil by means of street sweepers, brushing with a wire brush machine, which crushes the larvæ and pupæ, cultivation in connection with irrigation, and by a burning machine are briefly reported. The results seem to indicate that as a protection for the second crop the use of the street sweeper is of considerable value. In experiments with the brush machine it proved very effective in crushing the larvæ and pupæ among the stubble. An examination showed that while the treated field was in good condition with few larvæ, the nearby, untreated field was bare and brown from weevil attack. Good results were obtained from cultivation in connection with irrigation. Experiments were carried out with a machine constructed with the idea of burning over alfalfa fields after the removal of the first crop for the purpose of destroying the weevils in any state of development remaining in the field. "Oil was pumped from a barrel in the conveyance to which this machine was attached and forced through a rubber hose into a supply pipe which fed the nozzles and burners underneath. The oil under pressure came forth from the burners as a mist of fire blowing into the stubble and against the ground." A sheet-iron cover served to hold the heat down while an oven passed slowly over the surface. In its unperfected state the machine did effective work and offered ideas of value, warranting the construction of more efficient burners.

The predaceous enemies of the weevil include 3 species of lady beetles (*Coccinella 9-notata*, *Hippodamia spuria*, and *H. convergens*), the malachid beetle *Collops bipunctatus*, the tenebrionid beetle *Eleodes sulcipennis*, and the mite *Erythræus arvensis*. The predaceous mite *Pediculoides ventricosus* introduced from Indiana in March, 1911, did not attack either the larvæ or pupæ and while it fed freely upon the eggs of the weevil, where they were easily accessible, it seemed unable to gain access into many of the egg masses through the ordinary egg punctures. Only one specimen of a single true parasite of the alfalfa weevil, namely, *Ænoplegimorpha phytonomi*, has thus far been found in America. Two egg parasites, *Anaphes* sp. and an undetermined pteromalid, the latter of which is very effective in controlling the alfalfa weevil in Italy, were introduced from that country. Five parasites of the larvæ and pupæ, namely, an undetermined pteromalid, which attacks the larvæ and has actually

colonized itself in the field; *Canidiella curculionis*, which oviposits in the larvæ of the alfalfa weevil in different stages of development; *Phygadeuon* sp.; an undetermined species, probably *Mesochorus nigripes;* and *Itoplectis masculator* were also introduced from Italy. An additional species (*Hemiteles* sp.) about which very little is known may prove to be either a primary or secondary parasite. A list is given of 31 species of birds found by E. R. Kalmbach to feed upon the alfalfa weevil in Utah during 1911. From observations made in the vicinity of Salt Lake City on June 13, it is estimated the one-fifth of the cocoons contained larvæ or pupæ killed by the fungus *Empusa sphærosperma*.

The rice water-weevil and methods for its control (Lissorhoptrus simplex), E. S. TUCKER (*U. S. Dept. Agr., Bur. Ent. Circ. 152, pp. 20, figs. 2*).—This circular, based upon investigations conducted by C. E. Hood in 1910 and the author in 1911 in cooperation with the Louisiana Station, summarizes the available practical information concerning the weevil and measures for its control.

This insect is stated to be the most serious enemy of rice in the Southern States. In the larval stage it is known to rice growers as the "rice root-maggot." In this stage it commits severe injury to rice plants by destroying the roots; some harm is done by the adults in feeding on the leaves. General statements of the shortage of production caused by this pest vary from as low as 1 per cent at Beaumont, Tex., to 75 per cent in some fields at Stuttgart, Ark. In addition to cultivated rice its food plants include arrowhead, bulrush, galingale, water lily, spatter-dock, wild rice (*Zizania aquatica*), Walter's swale grass (*Paspalum membranaccum*), etc. The weevil swims readily on or beneath the surface and feeds, rests, and mates almost as frequently in the water as above it.

"The insect chooses food plants that grow in wet places and it breeds only where it finds water. Eggs are evidently laid on roots in water or mud, under which conditions the larvæ hatch, feed, grow, and transform into pupæ, and finally the adults mature and emerge. Two generations may possibly be produced in a season, but one generation seems to be the rule. Adults pass the winter in hibernation, appearing in spring and invading the rice fields.

"The most practical means of controlling the weevil consists in the practice of draining and allowing infested rice fields to dry sufficiently at the proper time or before the attacks of the larvæ have greatly weakened the plants. Alternate flooding and drying, if carried out properly, will accomplish the same results. Very shallow flooding or soaking of fields restrains infestation. Fertilization assists the plant to overcome injury. Considerable numbers of weevils can be captured at lights and destroyed, and the possibility of poisoning them in fields needs to be put to the test. Cultural management should be directed with the view of enforcing every advantage against the weevil that will be consistent with the welfare of the crop."

Mexican cotton boll weevil, W. D. HUNTER and W. D. PIERCE (*U. S. Senate, 62. Cong., 2. Sess., Doc. 305, 1912, pp. 188, pls. 22, figs. 34*).—This bulletin, prepared as Bulletin 114 of the Bureau of Entomology of this Department, and which is an elaboration of Bulletin 51 (E. S. R., 17, p. 161), gives a comprehensive account of the more important available information concerning the boll weevil. Since 1905 the work on the investigation of this important pest has been continued by the Bureau of Entomology and by various other agencies. As a resut of this recent work, certain features of the life history of the pest have received full treatment in publications of the Bureau, previously noted, as is the case with hibernation (E. S. R., 21, p. 761), natural control (E. S. R., 19, p. 756), parasites (E. S. R., 27, p. 59), proliferation (E. S. R., 18, p. 251), and repression (E. S. R., 20, p. 853).

The cause of European foul brood, G. F. WHITE (*U. S. Dept. Agr., Bur. Ent. Circ. 157, pp. 15, figs. 10*).—In feeding experiments with *Bacillus alvei, Streptococcus apis, B. mesentericus vulgaris, B. orpheus,* and *Bacterium curydice,* the author was unable to induce the disease commonly known as European foul brood.

"Considerabe quantities of filtrate from aqueous suspensions of crushed diseased larvæ were fed to healthy colonies and in no instance was European foul brood produced. This eliminated tentatively the probability of there being an ultra-microscopic virus in European foul brood capable of producing the disease. *Bacillus pluton* [=*Bacillus* Y] (E. S. R., 20, p. 857), therefore, was the only factor that was not so eliminated from the list of possible exciting causes of the disease and became thus the probable exciting cause of European foul brood. When this organism was studied in larvæ in which the disease could be suspected by inspection alone, one or more species of bacteria were sometimes found to be present also. These, when present, however, occurred in relatively small numbers.

"The disease was then studied in a still earlier stage; i. e., before its presence could be detected by gross examination of the larvæ. This was done by cultures in part, but principally by fixing and sectioning larvæ during the incubation period of the disease. This study demonstrated that in the production of the disease *B. pluton* was the first invader of the healthy larvæ."

Papers on insects affecting stored products.—The broad-bean weevil (Laria rufimana), F. H. CHITTENDEN (*U. S. Dept. Agr., Bur. Ent. Bul. 96, pt. 5, pp. 59–82, figs. 10*).—This weevil, commonly known as the bean beetle or bean seed beetle in Europe, has frequently been brought to the United States and Canada in its food supply, but there was no positive proof of its having become established in North America until 1909. In Europe it is common and destructive and especially infests the broad, horse, or Windsor bean (*Vicia faba*) and, it is said, peas and some other legumes.

The species is known to occur in middle and southern Europe and northern Africa; has long been credited as being a pest in England; and is recorded from the Canary Islands. In 1893 the author found this species commonly in many exhibits of broad or Windsor beans at the World's Columbian Exposition. In September, 1909, living specimens were received from San Luis Obispo, Cal., in horse beans, which have been grown quite extensively in that region for feeding stock. It appears to have become established in several localities in the State and bids fair to become a most formidable drawback to the cultivation of broad beans. Records of the occurrence of this pest in imported beans are briefly discussed. Notes on Occurrence in California (pp. 64, 65) and Experiments with Remedies (pp. 74–80), by W. B. Parker, are incorporated in the paper. Parker states that the weevil was first observed and captured in broad beans in Sacramento on March 25, 1911.

"The female weevil begins to deposit her eggs on the young seed vessel in the blossom before and after the former has developed into a pod. Here the eggs hatch and the larvæ penetrate into the growing seeds, each gnawing a gallery for itself, which it lengthens from time to time, as needed. When full grown, the larva transforms to pupa within the accumulated frass and develops later into the beetle stage." Like the closely related pea weevil (*L. pisorum*) it produces only a single generation a year and hibernates as an adult in the seeds.

Germination tests of infested beans from California show that "even in cases where a single individual weevil attacks a broad bean, less than 60 per cent of such infested beans germinate, whereas when 4 or 5 beetles find lodgment in a single seed, 32.3 per cent, or about one-third only, germinate. There is no

doubt that seeds containing holes made by this beetle are unfit for planting, as, even with perfect germination, the opportunity for the entrance of water into the seeds stimulates decay and the seed frequently rots before germination."

The natural enemies of this weevil include 3 hymenopterous parasites, *Sigalphus pallipes*, *S. thoracicus*, and *Chremylus rubiginosus*, first recorded by J. Curtis in England in 1863, and the predaceous mite *Pediculoides ventricosus*, which was observed in Sacramento in 1911. Experiments reported show that 140° F. is the lowest temperature at which all of the weevils are sure to be killed and that the germinative power of the bean is not seriously injured until the temperature reaches 160° or over. "Fumigation with bisulphid of carbon, at the rate of about 2 or 3 lbs. of the chemical to each 1,000 cu. ft. of air space for 48 hours, is a perfect remedy in an air-tight receptacle, as in the case of other bean and pea weevils." Directions are given for the construction of a fumigator.

An annotated bibliography of 29 titles is appended.

Keeping native bees in Paraguay, A. de Winkelried Bertoni (*Rev. Agron. y Bol. Estac. Agron. Puerto Bertoni, 4 (1910), No. 8, pp. 21–24; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 8–10, pp. 2258, 2259*).—The author, who has made several attempts to domesticate the native bees of Paraguay, obtained several successful results. The species reared belong to the genera Melipona, Lestrimellita, and Trigona. These bees are said to yield a more aromatic honey and higher priced wax than does the common honeybee. The bees of the genus Melipona are docile to domestication but are attacked by a dipterous parasite.

The behavior of Prospaltella berlesei in Italy, A. Berlese (*Redia, 7 (1911), No. 2, pp. 436–461; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 3, p. 831*).—The author, who introduced and has been conducting investigations relative to the value of *P. berlesei* in combating *Aulacaspis (Diaspis) pentagona*, finds that it adapts itself perfectly to the climate of upper Italy and is not injured by even the most intense winter cold. This parasite reproduces very readily in the regions where the winter is less lengthy and milder, as in Genoa and environs of the Garda Lake, and more slowly in the regions with severe winter as in Piedmont, where it probably goes through one or two generations less than in the hotter parts.

Parasitic enemies of the Mediterranean flour moth (Ephestia küehniella), W. W. Froggatt (*Agr. Gaz. N. S. Wales, 23 (1912), No. 4, pp. 307–311, figs. 2*).—A new parasite, described by Cameron as *Amorphota ephestia*, has been found to parasitize the Mediterranean flour moth in Victoria and New South Wales. "The parasites confine their attention to the many flour moth caterpillars that crawl out and pupate in the dust, flour, and rubbish on the walls and open places. They can not, or will not, enter the closed places, so that while the parasites have a considerable value in any mill infected with the Mediterranean flour moth when they destroy all the outside caterpillars, they also have their limitations, as they never make their way into the places where the main body of the caterpillars are feeding and pupating." Four specimens of *Bracon (Hadrobracon) hebetor* were bred from waste flour received from flour mills.

A hymenopterous parasite of Ixodes, R. du Buysson (*Arch. Par., 15 (1912), No. 2, pp. 246, 247, fig. 1*).—*Ixodiphagus caucurtei*, reared from many Ixodes nymphs collected on deer at Chantilly, Department of Oise, France, in October and at Fontainebleau in November is described as new to science. The species is closely related to *I. texanus*.

The zoocecids of North Africa, C. Houard (*Ann. Soc. Ent. France, 81 (1912), No. 1, pp. 128, figs. 268*).—In this paper 230 cecids are dealt with.

The fowl tick (Argas persicus), W. W. Froggatt (*Agr. Gaz. N. S. Wales, 23 (1912), No. 3, pp. 254–261, figs. 4*).—This paper contains new information which has come to hand regarding the identity and range of the fowl tick.

Trombidiidæ, A. Berlese (*Redia, 8 (1912), No. 1, pp. 1–291, pl. 1, figs. 137*).—This is a synopsis of the family.

The leaf blister mite (Eriophyes pyri), A. L. Quaintance (*U. S. Dept. Agr., Bur. Ent. Circ. 154, pp. 6, figs. 4*).—This is a brief summarized account of the knowledge of the blister mite, a report of studies of which by P. J. Parrott, H. E. Hodgkiss, and W. J. Schoene has been previously noted (E. S. R., 18, p. 955).

On the parasitism of a cynipid (Aulax scabiosæ) by Pediculoïdes ventricosus, G. R. Blanc (*Bul. Soc. Zool. France, 37 (1912), No. 5, pp. 191–197, figs. 5*).—The author reports a case of accidental parasitism of a gallicolous cynipid (*A. scabiosæ*) by the acarid *P. ventricosus*. A bibliography of 18 titles is appended.

Physiological investigations of entomophytous fungi, P. Portier (*Recherches Physiologiques sur les Champignons Entomophytes. Paris, 1911, pp. 47, figs. 10; abs. in Zentbl. Allg. u. Expt. Biol., 2 (1912), No. 21–23, pp. 565, 566*).—This work deals largely with studies made of a fungus (Isaria) and a diplococcus, which live symbiotically in the interior of the caterpillar, chrysalis, and adult of the lepidopteron *Nonagria typhæ*, which mines in the pith of *Typha latifolia*.

Cold storage of furs and fabrics, E. F. Tweedy (*Sci. Amer. Sup., 74 (1912), No. 1905, pp. 10, 11*).—This article describes the manner of applying cold in preventing injury by clothes moths. While a temperature of 40° F. is effective, the temperature most commonly carried in cold storage rooms ranges from 20 to 26°. At these lower temperatures the furs retain a fresh and glossy appearance, and the flexibility of the skins is preserved by a lessening of the evaporation of their natural oils.

FOODS—HUMAN NUTRITION.

The net weight or volume of food products which are sold in packages, J. P. Street (*Connecticut State Sta. Bul. 172, pp. 35*).—The text of the Connecticut law of 1911 on this subject is given, the general question of weight and volume of goods sold in packages is discussed, and data are reported regarding the size and weight of standard cans and results of the determination of the gross and net weights of a large number of samples of canned and package goods.

On the basis of weighings of 623 samples of canned vegetables, the author states that "the uniformity in weight of the contents of individual cans of the same brand of vegetables, excepting artichokes, peppers, succotash, and tomatoes, is very striking, and it appears that, in general, the manufacturer at present packs a fairly uniform amount of the vegetable in cans of the same size."

Observations regarding the amount of liquid and solid material in canned fruits and vegetables are reported but deductions are not drawn as it is expected to continue the work.

With 164 samples of canned fruits, the uniformity of weight was not so great as with vegetables, and in the author's opinion a somewhat greater allowance should be made, owing to the larger size of the fruits.

The 120 samples of canned fish, meats, and soups showed considerable uniformity in weight, with the exception of fish flakes, which showed much irregu-

larity in packing, and herring, which naturally varied because of the size of the fish.

Weighings of 257 packages of preserves, jelly, sirups, molasses, honey, pickles, ketchups, and condensed milk, showed that "all of the tin cans and most of the glass bottles of the same size showed fairly uniform weights."

In the case of biscuits and crackers, all but 4 of the 235 packages, representing 8 manufacturers and 27 brands, were guarantied both as to the number of biscuits and the weight of the packages. "The deviations from guarantied weight were exceedingly small."

Some weighings were made of packages of macaroni and similar pastes, prepared flour, baking powder, miscellaneous foods, and dried fruits. Of the latter, apples, currants and raisins showed only small variations while dates and prunes showed somewhat larger.

Of 594 samples in which the weight was stated, weighings showed that 517 of the samples either exceeded the claimed weight or were deficient by less than 0.25 oz. Seventy-seven of the samples showed a tendency toward short weight, but in 20 cases the deficiencies seemed to be exceptional. "The . . . [figures] show that manufacturers have little difficulty in satisfying the weights they claim for their products, and the . . . [data in the report] show that nearly all the products examined are packed with reasonably uniform weight." Additional weighings with other samples gave similar results.

Studies were also made of the shrinkage of dried fruits kept for different lengths of time, the results, according to the author, showing that "dried fruits naturally shrink from 4 to 28 per cent, depending upon the kind of fruit. It is not reasonable to expect that a manufacturer can so label his package as to net weight, as to cover all natural conditions liable to occur between the time it is packed and when the consumer buys it. On the other hand, the packer can control the weight of the fruit at time of packing. It seems reasonable and just, therefore, to require the packer to state on the label the net weight of the fruit when packed."

In general throughout the bulletin, recommendations are made relative to the allowances which should be permitted for variations in weight in the examination of goods sold in package form.

Food inspection decision (*U. S. Dept. Agr., Food Insp. Decision 145, p. 1*).—This decision has to do with oats and barley bleached with sulphur.

Decomposition and its microscopical detection in some food products, B. J. HOWARD (*U. S. Dept. Agr. Yearbook 1911, pp. 297–308, pls. 5*).—Causes of decay, methods of examination, molds, yeasts, bacteria, and animal invasions in foodstuffs are discussed with special reference to their detection by means of the microscope, as well as the susceptibility of different products to decay, organisms that may be properly present, and economic considerations. The article is based on the author's studies and is illustrated with reproductions of microphotographs. Marketing by the consumer of crops in proper condition, the effect of this upon losses from decay to the canner, and similar questions are also discussed.

"To efficiently solve the problem, the method of handling some products must be changed, since under present conditions it is practically impossible in some cases to get them to market in proper condition. In such an event it may be necessary to pack the product nearer the source of supply, instead of depending upon raw material that has spent a sufficiently long time in preparation to allow a more or less advanced state of decomposition to occur. The question of handling, from producer to consumer, is therefore of primary importance, as well as the methods of manufacture; in fact, the two problems are so closely related that no solution is practicable that does not consider both factors."

Green vegetables and their uses in the diet, C. F. Langworthy (*U. S. Dept. Agr. Yearbook, 1911, pp. 439–452, fig. 1*).—The classification of green and succulent vegetables, their color, flavor, and food values, their quality and factors which influence it, the preparation of green vegetables for the table, and canning and preserving vegetables are the principal questions considered in this summary of data on the nutritive value of this group of foodstuffs.

While green and succulent vegetables do not add greatly to the total nutrients and fuel value of the diet, they do increase the wholesomeness in three ways, namely, by supplying mineral constituents less abundant in some other common food materials, by providing bulk for the normal digestion of the more concentrated food materials, and by making the diet more varied and attractive, the last being perhaps the most important consideration for persons living under usual conditions on an ordinary mixed diet. Furthermore, green vegetables require relatively little preparation, many needing only to be washed before serving, while those which are eaten cooked are usually better when simply prepared.

Tropical fruit recipes and confections, Effie S. Rolfs (*Proc. Fla. State Hort. Soc., 24, (1911), pp. 119–138*).—A collection of recipes for the preparation and use of tropical fruits, particularly those grown in Florida, is given.

Foods—nutrition and digestion, Susanna Cocroft (*Chicago, 1912, 2. ed., pp. 315*).—The properties and nutritive value of foods, theories of nutrition, diets suited to abnormal conditions, and other topics are discussed. An appendix contains recipes.

Concerning experimental scurvy: A contribution to the influence of a one-sided diet, A. Holst and T. Frölich (*Ztschr. Hyg. u. Infectionskrank., 72 (1912), No. 1, pp. 1–120, pls. 3*).—The authors found that when guinea pigs were fed different grains or bread exclusively, a disease was produced in about a month which had the same characteristics as scurvy. Like scurvy, it was prevented or cured by feeding cabbage, carrots, or dandelions. The protective power of fresh vegetables was generally lost or weakened by cooking; for instance, cabbage cooked at from 110° to 120° C. had less protective power than cabbage cooked at 100°. The fresh vegetables also lost their prophylactic power if dried for a long time, as was also the case with antiscorbutic vegetables used as human food. The juice of cabbage leaves, as distinguished from the leaves themselves, lost some of its antiscorbutic power if heated for 10 minutes at from 60 to 70 or 100°.

From their studies, the authors conclude that the antiscorbutic properties are due to compounds not yet identified, which are weakened or destroyed by heat. In general, they believe that acidosis is not the cause of scurvy.

The extract obtained by treating freshly dried cabbage with a 0.5 per cent aqueous solution of citric acid possessed strong antiscorbutic properties. Extracts obtained with absolute alcohol or petroleum ether did not possess such properties.

A contribution to the etiology of experimental scurvy in guinea pigs, V. Fürst (*Ztschr. Hyg. u. Infectionskrank., 72 (1912), No. 1, pp. 121–154, figs. 5*).—Dried beans, lentils, and almonds were used in the experiments reported, as well as mixed rations. The author found that other dried seeds fed alone produced scurvy in the same way as dried grains, though the disease occurred later and in milder form.

The effects of a mixed diet, chiefly of preserved and dried food, varied with the character of the diet and the proportion of antiscorbutic material it contained. Allowing the seeds to sprout in certain cases rendered them antiscorbutic. According to the author, the antiscorbutic properties of certain foods are not attributable to protein, fat, carbohydrates, cellulose, or salts, or to any

chemical constituent which he was able to identify. In the same way he does not think the disease attributable to enzyms in general, to any special enzyms, or to any infection.

The general conclusion is that death results from under-feeding but that this in itself is not the cause of the disease.

Experimental studies of infantile scurvy, T. Fröhlich (*Ztschr. Hyg. u. Infectionskrank., 72 (1912), No. 1, pp. 155–182*).—The author studied especially the effects of cooking milk, and found that in general the exclusive use of either raw milk, boiled milk, or milk heated to a high temperature eventually produced a disease having the characteristics of scurvy, and that the use of lime juice had a beneficial effect which was not the case with cabbage or sodium citrate.

The author also studied the effects of raw milk added to a ration of oats. He notes that raw milk hindered the occurrence of scurvy, while milk heated for 10 minutes at 100° C. had lost this property. In an attempt to determine the different temperatures at which milk loses this protective power, he found that milk heated 30 minutes at 70° prevented scurvy.

The introduction of maize into Italy and pellagra, C. L. Alsberg (*Reprint from South. Med. Jour., 1912, Apr., pp. 170–172*).—This article calls attention to certain statements made in the literature that have caused confusion in the terms applied to maize. The discussion has especial reference to the occurrence of pellagra in Italy.

The chemical nature of the substance which cures polyneuritis in birds induced by a diet of polished rice, C. Funk (*Jour. Physiol., 43 (1911), No. 5, pp. 395–400; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 592, II, p. 186*).—The occurrence of polyneuritis in birds fed a diet of polished rice is due to the lack of a substance which is present in the polish in minute quantities, probably not more than 0.1 gm. per kilogram of rice. This substance, according to the author, is an organic base which is completely precipitated by phosphotungstic acid, silver nitrate, and barium hydroxid. It yields a crystalline nitrate. The curative dose for pigeons is very small.

Other analytical and chemical data are reported.

A new respiration calorimeter for use in the study of problems of vegetable physiology, C. F. Langworthy and R. D. Milner (*U. S. Dept. Agr. Yearbook 1911, pp. 491–504, pls. 3*).—Preliminary experiments having shown that ripening fruit (bananas) could be studied with the respiration calorimeter and that measureable quantities of carbon dioxid and water vapor were given off, oxygen absorbed, and heat liberated, and that the determination of such factors was important in considering problems which are being studied by the Department, a small respiration calorimeter was built of special size and construction, and particularly suited to the study of ripening fruit and other problems of plant life.

In principle and plan, it corresponds to the large respiration calorimeter which is used for experiments with man (E. S. R., 27, p. 466), although improvements in grouping accessory apparatus have been introduced and some new regulating devices have been installed. These greatly lessen the labor of conducting the experiments and which insure even greater accuracy, and make the apparatus as regards heat measurements practically self-regulating and self-recording. The new respiration calorimeter is especially designed for the study of ripening fruit and other vegetable products. "However, it is so constructed that the respiration chamber can be removed and another substituted for it, of the same size but with different interior arrangements, or of smaller size, should this be desirable. This would not involve any change in

the recording and controlling devices and other accessory apparatus. In other words, it would be possible, with little additional labor, to adapt the apparatus to the study of additional problems, such, for instance, as the incubation of eggs and the changes which take place in curing and storing meat products and cheese, or by making suitable provision for the collection of excretory products and for the comfort of the subjects, it would be possible to adapt the calorimeter to experiments with laboratory animals, should the work of the Department make this necessary."

ANIMAL PRODUCTION.

Native cacti as emergency forage plants, J. J. THORNBER (*Arizona Sta. Bul. 67, pp. 457–508, pls. 8*).—This gives a report of a number of years' experience in planting both spiny and spineless cacti for stock feeding.

Both the prickly pears and chollas are recommended as emergency forage, the former because they grow more readily from cuttings, suffer less from the effects of singeing and close browsing than chollas, and are best adapted for planting on the range with the idea of feeding the green vegetative parts after singeing or chopping them. Chollas are useful for their crops of fruit, the best yields being obtained from moderately large plants with a maximum vegetative growth, and should not be singed or otherwise cut back except in extremity.

Spineless cacti of the Monterey or Chico varieties even in a rabbit-proof fence failed to make successful growth except when irrigated, being injured both by severe winter freezes and extreme heat and drought.

A key and short descriptions of the more common species of economic cacti and their habitat are given. There are also reports of tests with native cacti, and directions for growing and using cacti for cattle food.

Nutritive value of cholla fruit, A. E. VINSON (*Arizona Sta. Bul. 67, pp. 509–519*).—Metabolism experiments with cholla fruit, water grass, and the second cutting of alfalfa hay were undertaken with 2-year-old native Merino sheep. The water-grass hay consisted mainly of *Chloris elegans*. Water grass was given ad libitum with a small amount of alfalfa, until the animals became reconciled to the experiment. On the sixth day a small amount of cholla fruit was added to the ration, and the quantity gradually increased. It seemed to act as an appetizer, and the animals ate the hay with more relish, due probably to the acidity of the fruit, which is as sour as green grapes and also mucilaginous. After the tenth day cholla fruit was given ad libitum, together with 230 gm. of water grass and 250 gm. of alfalfa to 1 sheep, and an additional 50 gm. of alfalfa to the second sheep. On the thirteenth day the first sheep left a small residue of hay as well as of cactus, due in part to increasing atmospheric temperature. From this time on the water grass was withdrawn entirely and the alfalfa ration much reduced, although the cactus was supplied ad libitum. The experiment with the first sheep was discontinued on the nineteenth day on account of the heat. With sheep No. 2 the experiment was discontinued on the twelfth day for the same reason.

There was a heavy loss in the nitrogen balance for the first 2 days, due to the change in ration from alfalfa to one composed largely of water grass, and also due in part to the restraint and unrest caused by the harness and other apparatus. From the eighth to the fourteenth day, with increased cactus ration and a restricted supply of alfalfa, the nitrogen income was in excess of the nitrogen outgo. During this period, except on the ninth day, 4.85 lbs. of cholla fruit was placed before the animals daily, so that on those days the animals would probably have eaten more had it been accessible.

After the fourteenth day the feces became physically abnormal, and it was evident that the animal could not maintain its nitrogen equilibrium with cholla fruit alone, but regained both strength and flesh when again given alfalfa.

Attempts were made to repeat the experiment, using pads of prickly pear (*Opuntia discata*), which were singed and cut into small squares, but the sheep refused to touch them. This experience is in accord with the observations of shepherds, which show that sheep eat greedily the fruits of cactus but never take the stems. In the case of cattle the joints, as well as the fruit, can be utilized.

The coefficients of digestibility of the water-grass hay used in the ration were as follows: Dry matter 47.36, protein 50.08, ether extract 27.39, carbohydrates 45.81, crude fiber 57.51, and ash 32.87 per cent. The coefficients of the cholla fruit were dry matter 60.75, protein 49.8, ether extract 74.15, carbohydrates 76.09, crude fiber 12.79, and ash 40.12 per cent. The analysis of water-grass hay was as follows: Dry matter 94.2, protein 7.56, ether extract 1.09, carbohydrates 36.41, crude fiber 31.18, and ash 17.96 per cent. The analysis of cholla fruit showed dry matter 21.11, protein 1.15, ether extract 0.87, carbohydrates 13.2, crude fiber 2.91, and ash 2.98 per cent.

"As a ration for maintaining sheep in a fair state of nutrition, cholla fruit alone would be required in amounts far in excess of the animals' capacity. At least 45 lbs. daily of the fresh fruit would have to be consumed. This would produce 10 lbs. or more of feces of normal consistency if scouring did not occur. The mineral constituents that would be absorbed from the intestine and require elimination by the kidneys would be excessive. Cholla fruit alone seems inadequate as a ration for maintaining the nitrogen equilibrium and, consequently, life, over any considerable period. However, with the aid of ½ to ¾ lb. alfalfa hay, 6 or more pounds of cholla fruit daily would probably not only preserve life in a sheep of 120 lbs. shorn live weight for an indefinite time, but allow some gain. Similar results with quantities increased in proportion to live weight may be anticipated for range cattle. This would require 4 to 6 lbs. of alfalfa, or its equivalent in concentrates, and 50 or more pounds of cholla fruit per head per day."

Feeding experiments with eosin barley, GERLACH (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 4 (1912), No. 4, pp. 374–387*).—Barley, when stained with eosin as required by law, when fed to swine did not affect unfavorably either the live animals or the quality of the meat. The iodin number and the melting point of the fat remained unchanged.

Analyses of feeding stuffs, H. B. MCDONNELL ET AL. (*Md. Agr. Col. Quart., 1912, No. 56, pp. 4–7*).—Analyses are reported of linseed cake, cotton-seed meal, meat meal, beef scrap, dried beet pulp, dried brewers' grains, gluten meal, malt sprouts, molasses feed, and mixed feeds.

Commercial feeding stuffs of Pennsylvania in 1911, J. W. KELLOGG (*Penn. Dept. Agr. Bul. 223, 1912, pp. 171*).—Analyses are reported of cotton-seed meal, linseed meal, corn-oil meal, distillers' grains, brewers' grains, malt sprouts, gluten feed, hominy feed, corn bran, corn flour, wheat offals, low-grade flour, rye offals, buckwheat offals, alfalfa meal, beet pulp, maize by-products, molasses feed, beef scrap, and proprietary mixed feeds.

Analyses of feeding stuffs (*Jahresber. Landw. Vers. Stat. Harleshausen, 1911–12, pp. 15–23*).—Analyses are reported of cotton-seed meal, peanut cake, sesame cake, rape cake, linseed cake, palm cake, coconut cake, soy-bean meal, susza cake, ajowan bran, wheat bran, rye bran, ground barley, barley bran, ground oats, rice meal, dried distillers' grains, brewers' grains, malt germ, molasses feed, sugar-beet chips, maize, oats, sugar beets, potatoes, beet leaves, meat meal, fish meal, feed lime, and mixed feed.

What the census tells about live stock, B. H. HIBBARD (*Country Gent., 77 (1912), No. 33, pp. 4, 5*).—A discussion of the live-stock statistics of the 1910 census.

[Live stock in Tunis], A. J. PERKINS (*Jour. Dept. Agr. So. Aust., 15 (1912), No. 10, pp. 1000–1011, figs. 3*).—This contains descriptions of the fat-tailed sheep, goats, cattle, camels, asses, mules, horses, and pigs in Tunis.

The finest cattle, A. KRAEMER (*Das Schönste Rind. Berlin, 1912, 3. ed., rev. and enl., pp. 310, pls. 4, figs. 82; abs. in Molk. Ztg. [Hildesheim], 26 (1912), No. 60, p. 1127*).—This is an enlarged and revised edition of a standard German work on judging cattle.

The meat industry, L. M. DOUGLAS (*London: Roy. Soc. Arts, 1912, pp. 34, figs. 23*).—This consists of the Cantor lectures before the Royal Society of Arts, February, 1912. It contains statistical data on the cattle, sheep, and swine industry and describes methods of packing and curing meat.

A history of the frozen meat trade, J. T. CRITCHELL and J. RAYMOND (*London, 1912, pp. XVIII+442, pls. 58*).—This contains a large amount of historical and statistical data on the export of beef and mutton from Australia, New Zealand, Argentina, United States, and Great Britain.

Investigations on the Bergschecken breed of cattle, and its position in the zootechnical system, E. KASERER (*Mitt. Ladw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien, 1 (1912), No. 2, pp. 163–215, pls. 2*).—This contains an account of the origin, characteristics, and past and present distribution of the type of cattle known as the Bergschecken and Ennstaler, and by other names. It is a native of Bavaria, Upper Austria, Salzburg, and Steiermark. Measurements made of the bones and of live animals are given.

Resorption in the stomach of ruminants, AGGAZZOTTI (*Clin. Vet. [Milan], Sez. Sci., 33 (1910), No. 1–3, pp. 54–75, pl. 1; abs. in Deut. Tierärztl. Wchnschr., 18 (1910), No. 30, pp. 446, 447; Jahrb. Wiss. u. Prakt. Tierzucht, 6 (1911), p. 177*).—The abomasum and reticulum were found to have only a small capacity for the resorption of water. A decrease in sugar was thought to be due to the decomposition by ferments and organisms carried into the stomach by means of the hay. The psalterium had a large resorption capacity for both water and sugar solution.

Fundus glands of pig's stomach, G. ULKAN (*Anat. Anz., 41 (1912), No. 2–3, pp. 78–80; abs. in Jour. Roy. Micros. Soc., 1912, No. 4, p. 394*).—The author finds that the epithelium of the pig's stomach is from the first a single layer, and sharply separated from the mesodermic tunica propria by a distinct membrana propria. The fundus glands arise in the epithelium without help from mesodermic elements. The primitive pits give rise to the definitive pits and fundus glands.

Forage crops for swine, L. A. WEAVER (*Missouri Sta. Circ. 55, pp. 163–166, figs. 3*).—A popular account, summarizing the results of work previously noted (E. S. R., 25, p. 274), together with some additional data.

Hominy feed for fattening hogs, J. H. SKINNER and F. G. KING (*Indiana Sta. Bul. 158, pp. 267–279*).—The average of 3 tests in comparing hominy feed with corn meal for swine feeding gave the following results: On a ration of hominy feed and shorts 2:1, the average gain per head and day was 0.759 lb., at a cost of 6.31 cts. per pound. On a ration of corn meal and shorts 2:1, the corresponding gain was 0.636 lb., at a cost of 6.05 cts. per pound. In 4 trials, on a ration of hominy feed and tankage 20:1 the daily gain per head was 1.446 lbs., at a cost of 4.81 cts. per pound, and on corn meal and tankage 20:1, 1.203 lbs., at a cost of 4.31 cts. per pound.

"Hominy feed produces more rapid gains on hogs than does corn meal. Hominy feed produces gains on less grain than does corn meal. As a general rule, the high cost of hominy feed hinders its more general use as a hog feed and prevents its economical substitution for corn, except when the latter is very high in price."

Swine breeding in Madagascar and its future, J. F. BRIGANDAT (*L'Élevage du Porc a Madagascar son Avenir. Tananarivo, Madagascar, 1912, pp. 21*).—A general account of swine breeding and of recent progress made in the swine industry in Madagascar.

Forage rations for growing horses, W. P. SNYDER (*Nebraska Sta. Bul. 130, pp. 3–15, figs. 2*).—These tests were undertaken to determine the value of alfalfa pasture and alfalfa hay in maintaining colts from weaning time to maturity. Most of the dams of the colts were Montana mares, sired by a pure-bred Percheron stallion. There were 7 mule colts, and 32 colts in all.

All of the animals ran together in an alfalfa field containing alfalfa stacks from the time they were weaned about October 1, 1907, until January 1, 1908, when they were divided into 3 lots. During the weaning time and the remainder of the first winter they were fed 4 lbs. of grain per head per day consisting of corn and oats 2:1. None of the colts received grain regularly after the first winter, except the lot on prairie hay and cane hay, which was given emmer. During the summer that they were 2 years old they were broken into work, grain being fed during that time.

The average gains per head and day for 3 years were as follows: Alfalfa hay in winter and alfalfa pasture 0.61 lb.; alfalfa hay in winter and prairie pasture in summer 0.55 lb.; and prairie hay and cane hay in winter and prairie pasture in summer 0.48 lb. The average cost of feed per colt for the 3 lots was $65.30, $52.48, and $45.48, respectively. The colts made a greater gain during the first winter and during the first summer after weaning than at any later period. The gains were also greater the second year than in the third year.

It was not considered profitable to pasture the alfalfa during the summer, or at least after the first summer, although it might have been profitable if the colts had been sold as yearlings or as 2-year-olds, if there had been some special incentive for getting rapid gains, or the cost of alfalfa pasture and the native grass pasture had been about the same. The alfalfa pasture put the colts in excellent condition.

Investigations on the chemical composition of the metacarpus of light and heavy horses, B. HARDT (*Untersuchungen über die chemische Zusammensetzung des Röhrbeins (Metacarpus) von Lauf- und Schrittpferden. Inaug. Diss., Univ. Jena, 1910, pp. 59; rev. in Jahrb. Wiss. u. Prakt. Tierzucht, 6 (1911), pp. 168–170*).—On the whole, the bones of the heavy horses contained more organic matter and less mineral matter than the bones of the light horses. Some minor differences in chemical composition were found, but it was concluded that there are greater differences in the form and physical properties than in the chemical composition of the bones of the 2 types. The influence of sex, age, and other factors are also discussed.

Origin and history of all breeds of poultry (*Chicago, Ill. [1912], pp. 64, pls. 8*).—This contains a brief account of the origin and history of all common varieties of chickens, ducks, and geese.

The handling and marketing of eggs, H. M. LAMON (*U. S. Dept. Agr. Yearbook 1911, pp. 467–478, pls. 2*).—A discussion of the causes of large losses due to faulty methods of marketing eggs, which is based largely on work previously noted (E. S. R., 26, p. 78).

Egg classification at New York (*N. Y. Produce Rev. and Amer. Cream., 34 (1912), No. 4, pp. 174, 176, 177, figs. 2; Farm Poultry, 23 (1912), No. 8, p.*

205).—This contains the rules which have been adopted by the egg committee of the New York Mercantile Exchange.

Double eggs, C. W. HARGITT (*Amer. Nat., 46 (1912), No. 549, pp. 556–560, figs. 3*).—Two types of malformed eggs are illustrated and described.

Investigations on crooked-breasted fowls, C. D. STEWART (*Ann. Sci. Bul. Roy. Agr. Col. Cirencester, 1911, No. 3, pp. 73, 74*).—When both cock and hens had this defect it was found not to be inherited in the offspring. As it was produced by allowing chicks to rest on perches when young, it is thought that unsuitable perches or perching at too young an age may be the cause of the trouble.

Preliminary note on crosses between pheasants and fowls, J. R. AINSWORTH-DAVIS (*Ann. Sci. Bul. Roy. Agr. Col. Cirencester, 1911, No. 3, pp. 71, 72, pl. 1*).—A brief note on experiments in crossing a Mongolian pheasant cock with golden-pencilled Hamburg hens, and an old English game bantam cock with common hen pheasants.

Sex-linked inheritance in poultry, T. H. MORGAN and H. D. GOODALE (*Ann. N. Y. Acad. Sci., 22 (1912), pp. 113–133, pls. 3, figs. 4*).—Crosses were made between Plymouth Rocks and Langshans and the American Dominique and Langshans. Data are reported on barring, shank color, booting, down color, white-feathered wings, and the color of bill and legs.

A case of sex-linked inheritance in the domestic pigeon, L. J. COLE (*Science, n. ser., 36 (1912), No. 919, pp. 190–193*).—This contains additional notes to a brief report of work previously noted (E. S. R., 21, p. 274).

Dun, yellow, and silver are considered as dilute conditions of black, red, and blue respectively, and the phenomenon of dilutions in this case furnishes another instance of sex-linked inheritance. A full report of the work is promised in the near future.

On the inheritance of tricolor coat in guinea pigs and its relation to Galton's law of ancestral heredity, W. E. CASTLE (*Amer. Nat., 46 (1912), No. 547, pp. 437–440*).—The advantages of the Mendelian over the Galtonian interpretation of tricolor inheritance in guinea pigs and in Bassett hounds are pointed out.

Physiological sex determination, B. C. GRUENBERG (*Science, n. ser., 35 (1912), No. 902, pp. 593, 594*).—A criticism of the argument by Robinson previously noted (E. S. R., 26, p. 773) that the suprarenal capsules are concerned in the determination of sex.

"A more general criticism of Robinson's argument lies in the tacit assumption that sex differentiation means one thing in the higher vertebrates and man, and quite a different thing in the rest of the animal kingdom and in plants. It may well be that there are several distinct factors concerned in sex determination, but these must all belong to related categories. It is extremely improbable that sex is determined by an accessory chromosome among insects, by adrenalin among mammals, by traumatism among gramineæ, say, and by ultra-violet rays among mosses."

The present position of the sex problem, R. HERTWIG (*Biol. Centbl., 32 (1912), Nos. 1, pp. 1–45, figs. 7; 3, pp. 129–146*).—A compendious summary of investigations on the sex ratio, with special reference to Mendel's law and the accessory chromosome. A bibliography is appended.

Cell structure, H. STAUFFACHER (*Ztschr. Wiss. Zool., 95 (1910), No. 1, pp. 1–120, pls. 2, figs. 3; 98 (1911), No. 3, pp. 478–527, pl. 1, figs. 5; abs. in Jour. Roy. Micros. Soc., 1912, No. 4, p. 393*).—Among numerous other studies on the structure of cells in the lower animals, the author finds more or less nuclein in the nucleus of young ova but none in the nucleus of ripe ova. The head of the spermatozoon in Anodonta was found to be full of nuclein, and it is suggested

that this acts as a ferment in starting the process of growth in the ripe ova. There was an abundance of nuclein found in the sporocysts of Trematodes, which reproduce parthenogenetically.

These studies indicate that the presence of nuclein is closely associated with metabolism during rapid growth.

DAIRY FARMING—DAIRYING.

Dairying in connection with farming, A. A. TURNER (*Alabama Tuskegee Sta. Bul. 22, pp. 3–11*).—A popular discussion on the advantages of dairying as a side issue in connection with general farming, including forms for dairy records.

More winter dairying in South Dakota, C. LARSEN (*South Dakota Sta. Bul. 134, pp. 286–305, figs. 5*).—This bulletin was written to show the advantages of having cows freshened in the autumn in order to increase the output of butter during the winter months. The topics discussed are shelter, silage, and other important conditions for successful winter dairying.

Relation of dairy cow to producer and consumer, O. F. HUNZIKER (*Hoard's Dairyman, 43 (1912), No. 23, pp. 811–813, figs. 2*).—This is an address presented at the meeting of the Indiana shippers of dairy products, 1912, and contains statistical data on the amount and value of dairy products, prices paid for milk fat, international trade in butter and cheese, and the value of the fertility contained in dairy products and shipped away from the farm.

Relation between yields of milk and yields of fat in dairy cattle, F. R. MARSHALL (*Amer. Breeders Mag., 3 (1912), No. 2, pp. 148, 149*).—According to figures furnished by O. W. Reagin, the correlation between the pounds of milk and percentage of fat in Guernsey, Jersey, and Holstein cows was found in all cases to be a negative one, showing that high milk yields are at the expense of richness in fat, or, in other words, that the yield of fat tends to constancy. The yield of milk and the percentage of fat are much more variable than the total amount of fat.

The effect of agitation on milk separation, T. BERG (*Nord. Mejeri. Tidn., 26 (1911), No. 34, p. 399; N. Y. Produce Rev. and Amer. Cream., 32 (1911), No. 22, p. 808*).—It was found that in a separator which did not skim milk satisfactorily the dasher of the pasteurizer had a speed of 180 revolutions per minute and the fat percentage in skim milk was 0.1. When the milk was heated in a water bath and separated the skim milk showed only 0.06 per cent fat. When the speed of the dasher in the pasteurizer was reduced to 132 revolutions the separation left 0.06 per cent of fat in the skim milk, showing that the defect could be remedied in two different ways.

Machine-drawn v. hand-drawn milk: An inquiry into the relative bacterial content, N. MACDONALD (*Proc. Roy. Soc. Victoria, n. ser., 24 (1912), No. 2, pp. 420–431*).—In these tests 2 cows were milked by hand and 2 by machine, and all sources of contamination were removed as far as possible.

When the strippings of the machine-drawn milk were added to the bulk of the milk before sampling, the hand-drawn milk showed 5,000 bacteria per cubic centimeter and the machine-drawn milk 10,750 as a daily average, but during the period when no strippings were added to the machine-drawn milk the average figures were 9,500 for the hand-drawn milk and 3,500 for the machine-drawn milk. Taking the period as a whole, the average per cubic centimeter was 7,500 for hand-drawn milk and 6,750 for the machine-drawn.

It is stated that no definite conclusions could be drawn from these figures, because during the first half of the first period the average tests were much more approximate than during the second half. In addition to the ordinary lactic bacteria, cocci (particularly Staphylococci) and sarcinæ were prominent.

while Streptococci were comparatively rare. Various forms of Saccharomyces were frequently found. The colon bacillus was not common, and the liquefying bacilli present were those commonly found in water. A number of doubtful species were tested for their pathogenicity, but in no instance were the results fatal to laboratory animals, and rarely was there a passing inflammation produced.

Some of the results are summarized as follows: "Provided the apparatus of the milking machine is intelligently handled, and it is thoroughly attended to as regards cleanliness and sterilization, its use does not interfere with the general health of the cow or of the udder. The milking machine so used does not lead to a greater bacterial contamination of the milk than does the process of hand milking, even when conducted under the most approved conditions, but on the contrary the average results show an improvement."

The Copenhagen milk supply, J. H. MONRAD (*N. Y. Produce Rev. and Amer. Cream., 34 (1912), No. 7, pp. 346, 348, 350, 352*).—An account of a method of furnishing a sanitary supply of milk to Copenhagen, which has had no epidemic traceable to milk since 1901. Since 1880 the death rate of children has dropped from 219 to 119 per 1,000, due in large part it is thought to the improvement in the methods of handling milk. The translation of the text of the Copenhagen milk ordinance is given.

Regulations governing the sale of milk in Prussia (*Molk. Ztg. [Hildesheim], 26 (1912), No. 64, pp. 1202–1205*).—This contains the text of the regulations issued July, 1912, by the Minister of the Interior, Agriculture, and Public Domain.

Milk products in the Siebenburg region of Hungary, F. BAINTNER (*Kisérlet. Közlem., 15 (1912), No. 2, pp. 227–268*).—This reports analytical data on cream, butter, buttermilk, cheese, and whey obtained from the milk of sheep and buffalo.

Measuring color: An oleo standard (*Hoard's Dairyman, 44 (1912), No. 6, p. 131*).—A report of an examination by optical methods of numerous samples of butter and oleomargarine. As the result of this work it is suggested that the latter be deemed an imitation of butter only when it contains less than 55 per cent of white.

Parchment paper for dairy use, M. SIEGFELD (*Molk. Ztg. [Hildesheim], 26 (1912), No. 60, pp. 1125, 1126*).—The author reports analyses of 66 samples of parchment papers sold for wrapping dairy products. The content of water-soluble material ranged from 0.13 to 28.25 per cent, and the ash from 0.28 to 7.89 per cent. Only 23 samples could be designated as of good quality when judged by the standard advocated by Burr and Wolff (E. S. R., 23, p. 616).

Factory arrangement, F. W. CULBERTSON ET AL. (*N. Y. Produce Rev. and Amer. Cream., 34 (1912), No. 7, pp. 364, 365, figs. 3*).—This contains plans of several cheese factories showing the arrangement of apparatus.

VETERINARY MEDICINE.

Principles of microbiology: A treatise on bacteria, fungi, and protozoa pathogenic for domesticated animals, V. A. MOORE (*Ithaca, N. Y., 1912, pp. XI+506, figs. 101*).—This volume has been prepared as a text-book for veterinary students beginning the study of microbiology. It is said to be the outgrowth of a lecture course which accompanied laboratory work in bacteriology and protozoology. "In its preparation, the purpose has been to point out the place and rôle of micro-organisms in nature; to give the methods for their study and identification; to indicate the relation of certain species to animal diseases; to give a description of the more important species pathogenic for

animals; and a brief discussion of the reaction of the tissues to microbian invasion and the theories of immunity."

Text-book of pathology, J. G. ADAMI and J. MCCRAE (*Philadelphia and New York, 1912, pp. X+17–759, pls. 11, figs. 304*).—This text-book, based upon the volumes previously noted (E. S. R., 24, p. 384), takes up both general (pp. 17–331), and special and systematic (pp. 333–708) pathology. Some 200 original engravings from drawings have been introduced in this work.

Results of research in the general pathology of pathologic anatomy of man and animals, edited by O. LUBARSCH and R. OSTERTAG (*Ergeb. Allg. Path. Mensch. u. Tiere, 15 (1912), pt. 2, pp. XV+967*).—The contents of this volume are as follows: Double Formations or Composite Monsters of Man and Animal, by H. Hübner (pp. 1–348); Storage of Glycogen in the Animal Body, by W. Klestadt (pp. 349–415); Pathology of the Thymus Gland, by J. Wiesel (pp. 416–782); Pathology of the Pancreas, by F. Albrecht (pp. 783–886); and Diseases of the Ear, by R. Panse (pp. 887–921). A voluminous bibliography in each case is appended.

Veterinary medicine, J. LAW (*Ithaca, N. Y., 1911, 3. ed., rev. and enl., vols. 2, pp. 597; 4, pp. 787*).—A third revised edition of these volumes (E. S. R., 13, p. 899; 14, p. 710).

Proceedings of the American Veterinary Medical Association (*Proc. Amer. Vet. Med. Assoc., 48 (1911), pp. 725, pls. 37, figs. 17*).—Among the more important papers presented in this report of the proceedings of the convention held at Toronto, Canada, in August, 1911, are the following: Observation on the Merits and Practicability of Resection of the Flexor Pedis Perforans Tendon, for the Relief of Open Navicular Bursa and Bayer's Operation for Quittor, by G. H. Berns (pp. 279–290); The Merits of Williams' Operation for Roaring, by F. Hobday (pp. 291–298); The Surgical Relief of Roaring, by W. L. Williams (pp. 299–317); Bacterins as an Aid in Wound Healing, by C. H. Jewell (pp. 326–335); The Cause and Treatment of Pulmonary Emphysema, by W. G. Hollingsworth (pp. 344–348); Hog Cholera Serum, by F. A. Bolser (pp. 349–361); Traumatic Pericarditis, by G. H. Roberts (pp. 362–368); The Treatment of Pneumonia and Pleurisy, by H. P. Hoskins (pp. 369–377); Intracellular Bodies Associated with Equine Anemia, by W. B. Mack (pp. 378–382); Observations Concerning the Pathology of Roup and Chicken Pox (E. S. R., 26, p. 889) by C. M. Haring and C. A. Kofoid (pp. 413–423); The Pathology of Nephritic Affections in Domesticated Animals, by K. F. Meyer (pp. 424–441); An Undescribed Pathogenic Bacterium in Milk (E. S. R., 26, p. 87), by E. C. Schroeder and W. E. Cotton (pp. 442–449); Bovine Hematuria in British Columbia (E. S. R., 26, p. 881), by S. Hadwen (pp. 450–462); The Etiology of Infectious Abortion in Live Stock (E. S. R., 26, p. 883), by E. S. Good (pp. 463–476); The Results Obtained in the Eradication of Tuberculosis from a Herd by the use of Tuberculosis Vaccine and the Bang System (E. S. R., 27, p. 382), by S. H. Gilliland (pp. 477–492); Immune Bodies and Biological Reactions (E. S. R., 26, p. 579), by A. Eichhorn (pp. 493–510); Susceptibility, Anaphylaxis and Immunity, by R. A. Archibald (pp. 511–518); Some of the Features of Sanitary Police Work as Applied in the Federal Quarantine Service (E. S. R. 27, p. 77), by R. W. Hickman (pp. 519–535); The Tuberculin Test (E. S. R., 27, p. 381), by P. Fischer (pp. 536–556); Anthrax and Tick Fever (E. S. R., 27, p. 81), by W. H. Dalrymple (pp. 557–571); The Control and Eradication of Glanders, by C. D. McGilvray (pp. 572–586); and The Sanitary Production and Handling of Commercial Milk, by C. Way (pp. 587–593).

The report of the committee on diseases includes papers on The Recurrence of Dourine in the United States, by J. R. Mohler (pp. 169–183); Foot Evil in Horses and Mules, and Sore Mouth in Dogs, by W. H. Dalrymple (pp. 183–

188); Biologic Products Used in Veterinary Medicine, by A. T. Kinsley (pp. 188–201); and The Effect of Nuclein on the Blood, by B. F. Kaupp (pp. 207–218).

Biological investigations in regard to pregnancy. Diagnosis of pregnancy with the optical method and dialysis, E. Abderhalden and M. Kiutsi (*Hoppe-Seyler's Ztschr. Physiol. Chem., 77 (1912), No. 4, pp. 249–258; Berlin. Tierärztl. Wchnschr., 28 (1912), No. 25, pp. 446, 447*).—The serum of pregnant subjects is capable of cleaving peptone prepared from the placenta. This act of cleavage can be noted with the polariscope, where it causes a change in rotation within 48 hours. By utilizing this principle the author believes he has an accurate method for diagnosing pregnancy. The tests were made with humans and several animals.

The results obtained with the method were confirmed by subjecting the various sera and placentas (previously boiled to remove biuret) to dialysis. From the serum coming from a nonpregnant subject no biuret test was obtained in the diffusate. Clinical results always substantiated the laboratory findings.

Study of the agglutinability of the various strains of Micrococcus melitensis, L. Negre and Raynaud (*Compt. Rend. Soc. Biol. [Paris], 72 (1912), No. 15, pp. 664, 665; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II. Ref., 5 (1912), No. 12, p. 253*).—The contradictory statements made in regard to the agglutination of *M. melitensis* led the author to study 5 strains of the organism, all from 24-hour old cultures contained in a salt solution and tested in a serum dilution of 1:30, and 37 of them human sera.

The microscopic method seemed to agree with the findings obtained by the macroscopic method. Some of the strains examined showed a marked agglutination, and agglutinated not only specific sera, but also normal sera. Other strains in the 1:30 dilution could be agglutinated only with sera which came from absolute clinical cases of Malta fever. The behavior of the individual strains seemed to be the cause for the conflicting statements which occur in the literature.

Anaphylaxis test with anthrax bacilli, B. Busson (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 12 (1912), No. 6, pp. 671–677; abs. in Centbl. Bakt. [etc.], 1. Abt., Ref., 54 (1912), No. 2, p. 50*).—Anaphylaxis could not be produced against anthrax bacilli or antibodies which could be detected in vitro. Thinking that the capsule-forming property of this organism was responsible for this, the author made tests with bacilli cultivated at 42.5° C., and as a result only atypical slimy capsules were produced. Anaphylaxis could be produced by these organisms in rabbits in so far that the rabbits showed an increase in temperature after the infection.

The precipitin reaction and anthrax in hogs, W. Pfeiler (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 25, pp. 463–466*).—The results of this work showed that even when conditions seemed different than those usually observed the diagnosis of anthrax in pigs could be substantiated by the precipitin reaction. Very often when negative cases are reported with the positive material some experimental error has crept into the process.

Aggressin immunization against blackleg, O. Schöbl (*Centbl. Bakt. [etc.], 1. Abt., Orig., 62 (1912), No. 3–4, pp. 296–304*).—Previously noted from another source (E. S. R., 27, p. 80).

The milk from cows affected with foot-and-mouth disease, H. Bertin-Sans and E. Gaujoux (*Rev. Gén. Lait, 9 (1912), No. 7, pp. 145–151*).—This is a study of the milk obtained from 10 cows suffering from foot-and-mouth disease and comprises the determination of the freezing point, acidity, catalase, and reductase.

It was found that the catalytic power was increased at the beginning of the disease and later returned to normal, so that this is to a certain measure an indication of the gravity of the condition. The reducing power (reductase) was determined by the authors' method, i. e., an aqueous solution of methylene blue 1 : 40, and an aqueous alcoholic solution of fuchsin 1 : 4,000. In most of the cases the reducing time was 3 hours or over at the outset and did not vary very much during the course of the disease, but in some instances the reduction time was lessened at the outset, though afterward increasing, and taking as a rule more than 3 hours.

The significance of the agglutination-complement fixation and the conjunctival test for the diagnosis of glanders, H. MIESSNER (*Centbl. Bakt. [etc.], 1. Abt., Orig., 63 (1912), No. 4–6, pp. 482–542, figs. 6*).—The height of the agglutination titer and complement-fixing values of the serum of glandered animals stands in direct relation to the age of the pathologic process but not to its extent. The author does not consider fixing values of 0.3 and 0.4 for the serum of horses in stables free from glanders to be suspicious, but does when found for the serum from animals in infected barns. It is also advisable to make the second or third tests 10 days apart.

The conjunctival test was used with 133 horses, among which were 59 clinically affected with glanders. Of these 59, 53 showed a positive ophthalmic test while none of the 74 horses classed as sound reacted. With the conjunctival test a reaction can be completed within from 14 to 20 hours after instilling the mallein, and when in doubt as to the results the test can be repeated within 24 hours and with the same eye.

A comparative study with the agglutination, conjunctival, and complement fixation tests was made with 74 horses for the purpose of determining the value of the tests. With the first named test 88.8 per cent of the horses which were positively glandered were detected; with the complement fixation method 100 per cent; and with the conjunctival test 94.4 per cent. With the last two methods no sound horses were diagnosed as being glandered.

A previous conjunctival-mallein test has no influence upon a subsequent agglutination test, although it seems to increase slightly the complement fixation values. The agglutination, complement fixation, and ophthalmic tests were studied with horses artificially infected per os and subcutaneously. The conjunctival reaction was noted from 5 to 9 days after infection, the agglutination test in from 5 to 7 days, and the complement fixation test in from 10 to 14 days after infection. Agglutination or complement-fixing bodies are not transmitted by the mother to the fetus.

Critical investigation in regard to the diagnostic value of the ophthalmic reaction in glanders, E. FRÖHNER (*Monatsh. Prakt. Tierheilk., 28 (1911), No. 1, pp. 1–35; abs. in Hyg. Rundschau, 22 (1912), No. 11, p. 711*).—The ophthalmic reaction was found very valuable for diagnosing glanders in horses. It was tested with 21 animals, which were undoubtedly glanderous, at the internal clinic of the veterinary high school at Berlin. The method was conducted by instilling from 1 to 2 drops of a mallein solution (0.05 gm. of mallein siccum [Foth] in 4.5 cc. of a 0.5 per cent solution of carbolic acid). After 12 hours a pronounced, thick purulent secretion was produced, which is not obtained with sound horses.

Experimental therapy of Rocky Mountain spotted fever, P. G. HEINEMANN and J. J. MOORE (*Jour. Infect. Diseases, 10 (1912), No. 3, pp. 294–304*).—"Horses are susceptible to spotted fever if the virus of guinea pigs is injected subcutaneously and intravenously. The fever usually takes a mild course and the temperature is not exceedingly high. Normal temperature appears again

after 7 to 9 days. It would be interesting to allow infected ticks to bite horses and determine whether the disease can be communicated that way.

"The serum from horses recovered from spotted fever has protective value. The potency is largest after about 12 days from the time of the reappearance of normal temperature.

"Repeated injection of spotted fever virus increases the potency of the serum materially, but does not produce a second attack of spotted fever.

"One cc. immune horse serum protects guinea pigs injected with spotted fever virus up to, and including, the first day of high temperature. If serum is given later there is no protection.

"Treatment of guinea pigs, injected with spotted fever virus, with sodium cacodylate and repeated every day, commencing with the first appearance of temperature, has no effect on the course of the disease."

Methods of exterminating the Texas-fever tick, H. W. Graybill (*U. S. Dept. Agr., Farmers' Bul. 498, pp. 42, figs. 19*).—This paper is a revision of Farmers' Bulletin 378 (E. S. R., 22, p. 163).

In regard to the origin and development of general tuberculosis, A. Jurgelunas (*Ztschr. Hyg. u. Infektionskrank., 78 (1912), No. 2, pp. 307–366*).—The conclusion reached by this author is that tubercle bacilli of human and bovine origin are simply varieties of the same organism.

Guinea pigs which were allowed to inhale dry and ordinary cultures of the human type of bacillus first showed the infection in the organs contained in the thoracic cavity. If, however, the animals were given an emulsion of the bacilli by way of the mouth the organisms passed quickest and easiest through the walls of the mouth and tracheal cavities.

The introduction of the human type of bacillus into the alimentary tract of rabbits in many instances did not cause tuberculosis, whereas bovine tubercle bacilli when given in this manner produced the disease very easily. Cultures of the human type of tubercle bacillus, when fed to suckling pigs, goats and sheep, produced no disease in these animals, while feeding the bovine type will produce tuberculosis. The best subjects for diagnosing the type of tubercle bacillus present in a given case are the rabbit and suckling pig.

Investigation in regard to the normal temperature of healthy and tuberculous rabbits as well as the local and general specific capacity of tuberculous rabbits to react towards tuberculin preparations, O. Raschke (*Untersuchungen über die Normaltemperatur gesunder und tuberculöser Kaninchen, sowie über die örtliche und allgemeine spezifische Reaktionsfähigkeit tuberkulöser Kaninchen auf Tuberkulinpräparate. Inaug. Diss., Univ., Leipsic, 1911, pp. 66*).—The temperature of healthy and artificially infected rabbits was found to fluctuate between 38.8 and 40.1° C., and in about 80 per cent of the animals examined between 39.2 and 39.7°. The ophthalmo reaction, cutaneous reaction, intradermal reaction, and local subcutaneous reaction conducted with phymatin bovis (Klimmer) yielded a large percentage of negative results and can therefore not be considered of any practical value for diagnosing tuberculosis in rabbits. The subcutaneous thermal reaction on the other hand was found to be satisfactory in doses of from 0.025 to 0.25 cc.

A bibliography of 50 titles is appended.

Tuberculosis in man and animal, A. Weber (*Centbl. Bakt. [etc.], 1. Abt., Orig., 64 (1912), Festschrift F. Loeffler, pp. 243–265*).—A critical review of work done in regard to the communicability of tuberculosis from animal to man.

The conclusion reached is that the bovine type of bacillus when compared with the human type plays only a secondary part as far as tuberculosis in man is concerned. Precautionary methods must therefore be directed primarily to preventing the transference of the disease from man to man.

The intradermal test for tuberculosis, F. W. PORTER (*Amer. Vet. Rev., 41 (1912), No. 4, pp. 463–465*).—After pointing out the difficulties encountered with the thermal method of testing, the author reports his results of a comparative study between the thermal and intradermal tests. "Of the 60 head tested by the intradermal method, all of which had reacted to the thermal test, 27 did not react to the intradermal test. Of this 27, 6 were considered as not clearly marked either way."

Antituberculosis serum, A. CALMETTE (*Bul. Inst. Pasteur, 10 (1912), No. 5, pp. 193–204*).—This is a general review of the work done in regard to antisera for tuberculosis. It deals with the following sera: Maragliano, Marmorek, S. Arloing and L. Guinard, Lannelongue, Archard and Gaillard, Vallée, Jousset, Ruppel and Richman, Bruschettini, and Rappin. The mode of action of the sera is discussed critically.

The relation of barium to the loco-weed disease (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 246, pp. 67, figs. 15*).—In a previous publication of the Department (E. S. R., 20, p. 280) barium was held responsible for the symptoms of loco poisoning. This has led to subsequent investigations, which are summarized below:

A field study on the relation of barium to the loco-weed disease, C. D. Marsh (pp. 7–37, figs. 15).—In order to confirm the previous conclusions, the author has carried on feeding experiments with horses and cattle to determine the possibility of preventing the disease, and he states that if barium is the cause of loco poisoning, sulphates would form a logical antidote. Experimental administration of magnesium sulphate and sulphuric acid fed in amounts much greater than necessary to neutralize the barium had no antidotal effect. Experimental feeding of barium salts produced symptoms which corresponded in general to those recorded in literature in acute poisoning, but without marked cumulative effect or acquired tolerance. The post-mortem appearances corresponded to those recorded in acute poisoning. The symptoms and pathology of barium poisoning were found to differ in a marked degree from those noted in loco poisoning. The author believes that typical loco poisoning is not produced by barium feeding alone.

Laboratory studies on the relation of barium to the loco-weed disease, C. L. Alsberg and O. F. Black (pp. 39–61).—The authors have carried on laboratory studies of a large number of plants to determine the action of barium in loco-weed disease, particularly as connected with the possibility that plants may under certain conditions derive harmful constituents from the soil.

They conclude from their experiments with laboratory animals that the etiological factor in loco weeds which is responsible for the toxicity of these plants in laboratory experiments is not barium. This conclusion is based on the fact that many plants from the Western States contain barium, but there is no evidence that such plants injure stock upon the range. Plants in certain sections of Virginia were found to contain barium in quantities that are of the same order of magnitude as in loco plants, but there was no evidence that such plants injure stock. In dried loco plants barium is contained in an almost insoluble form. Extracts prepared by digesting with artificial gastric and pancreatic juices contained but slight traces of barium, but, nevertheless, it is claimed that large doses of these may be toxic. There were usually found enough salts of calcium, potassium, and metals other than barium in the extract of 250 gm. of dried loco plant to account for the death of rabbits. Similar extracts of alfalfa may also cause death of rabbits in similar doses. Acetic-acid extracts of the ash of such barium-yielding plants from the Western States as were examined contained but minute traces of barium.

Investigations of the etiology of infectious abortion of cows and mares, E. S. GOOD (*Kentucky Sta. Bul. 165, pp. 227–229, pls. 13*).—The first part of

this bulletin (pp. 231–279) deals with infectious abortion of cows; the second part (pp. 280–296) with infectious abortion of mares.

This laboratory has isolated the germ of infectious abortion (*Bacillus abortus*) in 10 cases from 3 herds of aborting cows in Kentucky, 3 of which were from the internal organs of the fetus. "In one instance we secured a growth of this bacillus from the blood of the liver, kidneys, and umbilicus, and from the contents of the stomach and large and small intestines of the fetus. There were instances in which we were able to find this germ in the afterbirth and stomach of the fetus, but unable to secure a growth of the organism.

"Methods of isolation as well as the physiological, morphological, and cultural characteristics of this germ, together with illustrations of the same are given in this bulletin.

"The bacillus causing the disease of infectious abortion in cows has not as yet been isolated from the uterine exudate of aborting mares by this laboratory, nor as far as we know by any other laboratory. A bacillus belonging to the subgroup II, or intermediate group, of the colon-typhoid group (to which subgroup belong such pathogenic organisms as *Bacillus enteritidis* and *B. choleræsuis*) has been isolated by this laboratory from the afterbirth, the uteruses and the internal organs of fetuses, of 2 studs of aborting mares, and 1 stud of aborting jennets. In 2 instances the *B. coli communis* was found in large numbers in the fetal membranes of mares aborting in the early stages of gestation. The pathological changes in the afterbirth and internal organs of fetuses of aborting mares are much more marked than is the case with aborting cows."

A bibliography is appended.

Investigations of infectious abortion, E. S. Good (*Amer. Jour. Vet. Med., 7 (1912), No. 4, pp. 121–124*).—This paper relates to the investigations noted above.

With regard to the pathological changes in the internal organs of fetuses of aborting mares, "at times there are small ulcers about 1 mm. in diameter on the top of the auricles of the heart of a fetus of an aborting mare. The spleen is enlarged and thickly studded with petechia on its surface. The mesenteric lymphatic system is highly congested; the ovaries and uterus of a female fetus and testicles of a male fetus are usually much enlarged and hemorrhagic."

The diagnosis of infectious abortion in cattle, F. M. Surface (*Kentucky Sta. Bul. 166, pp. 303–365, pl. 1, figs. 4*).—This is a study of the comparative value of the agglutination and complement fixation tests for detecting animals which are infected with the *Bacillus abortus*. In all there were 576 animals tested, out of which 44.8 per cent gave a positive reaction. In 4 herds, comprising 151 cows, 23.1 per cent aborted a year previous to the test (only cows which had terminated at least 1 pregnancy being considered but including heifers which had aborted their first calves), and 56.3 per cent showed a reaction. Among the cows which aborted, 85.7 per cent showed a reaction, while in 3 of the herds 90 per cent or more of the aborting cows reacted to the tests. Of all the aborting cows only 3.3 per cent failed to show a reaction.

In general there was a close agreement between the agglutination and complement fixation tests, and in the majority of cases where there was no agglutination there was no complement binding. A small number of animals showed no complement fixation but agglutinated in dilutions of 1:20. Agglutinations of 1:100 are regarded by the author as practically specific, but in the tables shown many of the cows agglutinated in dilutions of 1:50 or 1:20. The agglutination test, therefore, should not be relied upon alone.

The bulletin includes a detailed statement of the technique of conducting both of these tests, a general description of the etiology, bacteriology, symptoms, etc., of the disease, and some practical suggestions for combating this condition.

The diagnosis of contagious abortion in cattle by means of the complement fixation test, F. B. HADLEY and B. A. BEACH (*Wisconsin Sta. Research Bul. 24, pp. 217–248, pls. 4, figs. 2*).—This bulletin concerns itself chiefly with the diagnostic methods for this disease, especially the complement fixation or binding method. To determine the practicability of the complement fixation test, the technique of which is described in detail, tests were carried out with the sera obtained from about 500 animals. These animals were distributed in widely separated herds, and were considered representative of the Wisconsin dairy industry.

"The accuracy of this method of diagnosis is as great as any method based upon a biological reaction. Further experimentation may perhaps suggest some modification of the present technique. Where large numbers of animals are to be tested, such changes would be acceptable if not made at the expense of accuracy. However, at present we find it quite possible to run tests on 50 or more animals a day without undue exertion.

"The test affords a reliable means by which infected animals may be detected. Proper methods of isolation and control may then be instituted by which the disease can be prevented from spreading to noninfected cows and heifers. It is a qualitative and not a quantitative test and simply indicates the presence or absence of the specific immune bodies; but clinical history has so closely corroborated the test that we may assume it to be a reliable guide as to the presence or absence of the abortion bacilli."

In order to determine if the test was rigidly accurate some additional experiments were made with the station herd, which included heifers unavoidably exposed to the infection and cows which were known to have aborted. The test detected infected animals a long time before they aborted. It furthermore showed that immune bodies were present longer than a year in some animals and that they gradually disappeared in other cases. In the case of 1 calf, which had dropped prematurely and was in constant association with infected animals, the animal did not show immune bodies up to the time when she was a year old. The serum of a herd bull, which associated with an infected cow, gave a positive reaction. Bacteriological examinations of 20 placental membranes were made with a result that 13 were found to contain the abortion bacillus.

"The interpretation of the reaction may be summarized as follows: (1) Cattle in which the serum shows a complete fixation of the complement in quantities of 0.01 cc. and 0.02 cc. are or have been infected with abortion bacilli. (2) Cattle in which the serum gives a complete complement fixation in the quantity of 0.02 cc. and an incomplete fixation in 0.01 cc. amount, also are or have been infected with the abortion bacilli. (3) Cattle in which 0.01 cc. of the serum shows no binding while the larger quantity gives an incomplete binding should be considered questionable reactors and retested after 4 to 6 weeks. (4) Cattle in which the serum shows no power of fixing the complement in either amount should be considered free from the infection."

Freezing was not found to kill the organism, strongly binding antigens being later prepared from the frozen strains, which were recovered in pure cultures.

Some field experiments with the test are also reported.

Immunizing tests in infectious intestinal catarrh, MIESSNER and KOHLSTOCK (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 25, pp. 450–452*).—The material obtained by scraping the intestinal mucus membranes of bovines infected with intestinal catarrh was rubbed up into a paste with comminuted mesenteric lymph glands in a mortar. A 20 per cent solution of antiformin was then added, stirring constantly during the process, the mixture transferred to a 10 to 20 liter flask, and the flask with its contents shaken for 2 days in a shaking device. The emulsion so produced was filtered and the filtrate centrifuged.

The sediment obtained, which consisted of practically only acid-fast bacilli, was dried in a Heim-Faust apparatus. The dried pulverent material was termed "enteritidin" by the authors. Sero-diagnostic tests with "enteritidin," using a suspension of this preparation as an antigen for the complement fixation method, resulted negatively with the serum obtained from cows having infectious intestinal catarrh.

In order to test the therapeutic value of the preparation 2 calves (Nos. 5 and 7) were given 100 mg. in a physiological salt solution intravenously. Two other animals, one sound (No. 6) and the other (No. 122) having an infectious catarrh of the entire alimentary tract, were given 100 mg. per os. Calf No. 6 was killed after 3 months' time and found to have a chronic intestinal catarrh. Calf No. 5 was destroyed 10 months after the injection, and although the mucosa of the alimentary tract seemed to be somewhat thickened no acid-fast bacilli could be detected in the mesenteric lymph nodes. A few organisms were found in the mucosa of the small intestine after an extended search. One year after the infection calf No. 7 was killed, but no bacilli could be detected in either the mucus membranes or in the mesenteric lymphatic glands, although when subjecting the tissues to the action of antiformin a few bacilli were noted. Three other animals, one infected and two healthy, were vaccinated intravenously with 100 mg. of the preparation, but these tests are not completed.

Some tests on the transference of infectious intestinal catarrh from mother to offspring through the agency of feces were also included, which show that without doubt the disease can be acquired during the suckling period.

In regard to sheep pox in Tunis and the attenuation of the virus by heating, E. Ducloux (*Compt. Rend. Soc. Biol. [Paris], 72 (1912), No. 7, pp. 279–281; abs. in Centbl. Bakt. [etc.], 1. Abt., Ref., 53 (1912), No. 8, p. 238*).—Sheep pox is enzootic in North Africa and causes many deaths among sheep, chiefly young sheep, during the rainy season. An attenuated vaccine which will produce the disease only at the site of injection can be prepared by heating virus in a water bath. All sheep intended for export were formerly treated with antipox serum.

Experimental investigations in regard to hog cholera, P. Uhlenhuth (*Centbl. Bakt. [etc.], 1. Abt., Orig., 64 (1912), Festschrift F. Loeffler, pp. 151–165*).—This is a critical review of work done on hog cholera under the direction of the author at the Institute of the Royal Health Department at Berlin. A comparison was made with the work of other investigators.

Hog cholera, C. D. McGilvray (*Amer. Vet. Rev., 41 (1912), No. 4, pp. 444–449*).—An outbreak occurred at Kenora, Manitoba, which involved 146 hogs. All of the animals were slaughtered. The results of the investigation in regard to the source of the disease furnished strong circumstantial evidence in support of the belief that it started by feeding uncooked swill or kitchen refuse which contained pork or pork products.

A preliminary report on the action of china berries, leaves, and blooms on pigs, C. A. Cary (*Amer. Vet. Rev., 41 (1912), No. 4, p. 455*).—Preliminary tests of the action on pigs of these materials have led to the following conclusions:

"The berries, leaves, and blooms all produce intoxication in pigs. Somewhat prolonged feeding of the berries will produce distinct fatty degeneration of the kidneys and liver. There are other changes, but these are the most prominent."

Helminthes parasitic in equines, R. T. Leiper (*Vet. Jour., 68 (1912), No. 446, pp. 469–472*).—This is a classified list of the nematodes, trematodes, and cestodes parasitic in equines, including 56 species representing 12 families and 17 genera.

Studies on fowl cholera.—II, The rôle of a homologous culture of slight virulence in the production of active immunity in rabbits, P. B. Hadley

(*Rhode Island Sta. Bul. 150, pp. 81–161*).—This continues work previously noted (E. S. R., 26, p. 185).

"Among 10 different strains of the fowl cholera bacterium investigated for their resistance-producing power, one (culture 52) was discovered which was capable of producing perfect immunity in rabbits to highly virulent cultures; this immunity was secured by means of subcutaneous, intravenous, and also intraperitoneal inoculations. That the resistance in question was not a local, or 'zonal,' immunity, was shown by inoculating previously protected rabbits in the ear, flank, or back, also by intravenous and intraperitoneal inoculations, none of which were fatal. The smallest amount of culture 52 yet used to produce immunity in rabbits is 0.000,000,01 cc.; but amounts as large as 3 cc. were tolerated, and gave similar results. Smaller amounts would, in all probability, also afford resistance. The resistance produced by inoculation with culture 52 was sufficiently strong to protect against at least 2 cc. of virulent culture when the M. L. D. [minimum lethal dose] of the latter was 0.000,000,000,000,000,01 (one-hundredquintillionth) cc.

"In protectively inoculated rabbits a slight resistance was manifested within 2 to 4 days, but complete immunity did not appear until the seventh day after the inoculation with culture 52. Complete immunity to the virulent culture (48) has been found to endure in protected rabbits for at least 10 months; it is, in all probability, permanently acquired. The simultaneous inoculation of culture 52 (amounts from 0.001 cc. to 1 cc.) and culture 48 (0.001) proved fatal in all cases; but the inoculation of 0.5 cc. of culture 52 prevented a fatal termination when inoculated simultaneously with 0.000,000,001 cc. of culture 48. Attempts to produce resistance in rabbits by the inoculation of dead or attenuated (by heating) cultures of strains 52 and 48 have thus far failed, except with repeated inoculation of 52. Immunity to culture 48 is inherited: Does, 6 to 7 months after their protective inoculation, have given birth to young possessing, at the age of 30 days, complete resistance to 0.01 cc. of the virulent culture; but no cases have been met with in which the young, at the age of 60 days, were still immune.

"The natural resistance possessed by guinea pigs to the fowl cholera organism can be so raised by subcutaneous inoculation with culture 52, that both subcutaneous and intraperitoneal inoculations with the virulent culture (48) are easily tolerated. Although gray rats are susceptible to fowl cholera, the strain of white rats used in this investigation possessed a high degree of natural immunity. In a few preliminary tests a moderate degree of resistance in pigeons and fowls to a virulent culture of the fowl cholera bacterium has been produced by intramuscular, and (more successfully) by subcutaneous, inoculations with culture 52; but this method, for birds, is as yet somewhat less reliable than for rabbits. Inoculation with culture 52 has been found to protect rabbits, not against virulent culture 48 alone, but also against the only other (three) highly virulent cultures obtainable at the present time. In two cases, as the result of a single subcutaneous inoculation with 0.5 cc. and 1 cc., respectively, of serum, derived from an actively immunized rabbit, 9 months after immunization, the fatal issue in the infected rabbits was delayed from 14 hours (control) to 4 and 5 days, respectively. Many of the phenomena observed in this study make it appear that the immunity being considered is an aggressin immunity in the sense in which this term is employed by Bail, Weil, and others. But the observation that various attenuated cultures, all of which possess about the same ability to grow at the point of inoculation (implying, according to this theory, approximately equal 'aggressiveness') demonstrate by no means equal resistance-producing powers, suggests that the aggressins and 'anti-aggressins' do not wholly explain the production of immunity in these cases. These inves-

tigations are being continued with special reference to (1) the production of active immunity in birds; and (2) the production of passive immunity in rabbits."

A bibliography is appended.

Primary principles in the prevention and treatment of disease in poultry, G. B. MORSE (*U. S. Dept. Agr. Yearbook 1911, pp. 177–192*).—The object of this paper is to impress poultry raisers with the importance of cleanliness in maintaining the health of poultry. The 7 primary principles outlined in the paper previously noted (E. S. R., 24, p. 188) are emphasized.

RURAL ENGINEERING.

Irrigation investigations, G. E. P. SMITH and F. C. KELTON (*Arizona Sta. Rpt. 1911, pp. 566–572, fig. 1*).—Hydrographic investigations in the Sulphur Springs, Rillito, and Santa Cruz valleys, carried on in cooperation with the U. S. Geological Survey, are reported giving river discharge data, and data relative to pumping plants and ground waters in the districts. A discussion of the application of the doctrine of priority in the use of underground waters is appended, the following conclusions being drawn:

"Priority in an underflow appropriation, then, ought not to be positive as it is in the case of surface streams, but should be subject to limitations as follows: (1) Any injury or interference must be proven clearly. (2) The injury must be considerable. Trivial injury, or slight injury at infrequent or short periods should not be cause for action. (3) A ditch owner must be reasonably willing to cooperate with his neighbors in the general development of the underflow. (4) A ditch owner must maintain his collecting head or flume in good condition as an efficient agent for taking and carrying water."

Measurement and distribution of irrigation water, L. M. WINSOR (*Utah Sta. Circ. 6, pp. 19–38, figs. 4*).—This circular gives the requirements for the construction and installation of the Cippoletti trapezoidal weir with complete end and bottom contractions and sharp crests, and gives directions and tables for its use in the measurement and division of irrigation water. Brief discussions are also given of time, division of water, and of the duty of water, with a few definitions and hints to aid the irrigator.

Possibilities and need of supplemental irrigation in the humid region, M. B. WILLIAMS (*U. S. Dept. Agr. Yearbook 1911, pp. 309–320, pls. 2*).—In treating this subject the author gives a brief historical note on the practice of irrigation in the United States, points out the relation of rainfall to irrigation, together with the importance of supplemental irrigation, and describes the possibilities and advantages of irrigation in the North Central, North Atlantic, and Southern States. In addition to the methods of irrigation adapted to the humid region and including surface irrigation, subsurface irrigation, and spray irrigation are briefly noted, and the possibilities and need of irrigation east of the Mississippi are pointed out.

Helping out the rainfall, A. C. TRUE (*Pop. Mechanics, 17 (1912), No. 4, pp. 521–528, figs. 10*).—This article deals with the value of irrigation as a supplement to rainfall in regions suffering from droughts between wet seasons, and discusses irrigation works and their benefits to general farming and truck gardening in the Eastern and Southern States.

The present outlook for irrigation farming, C. S. SCOFIELD (*U. S. Dept. Agr. Yearbook 1911, pp. 371–382*).—Although irrigation farming has become only recently an appreciable factor in American agriculture, the area has nearly doubled in the last decade, there being 14,000,000 acres of irrigated land in the United States at the time of the last census. The author finds that (1) the price of irrigated land in the West is generally increasing, so that much of

the colonization is based on a prospective rise in land values rather than on prospective crop production; (2) the cost of producing irrigated crops is generally greater than that of unirrigated crops, a fact not fully realized by many prospective settlers; (3) irrigated sections must usually pass through a period of economic depression resulting from the production of crops in excess of local demands.

Irrigation farming has, however, some distinct economic advantages, many of the lands being in the midst of range lands or near large mining enterprises or centers of trade, and others in a mild climate and long growing season which permit the production of crops that do not thrive elsewhere in this country. The author believes that the prosperity of irrigated land will depend upon development along one or more of the following lines: "(1) Diversification of crops and development of local industries to such an extent that the raw crop products are largely consumed locally; (2) the production of special crops that can not be grown as well under rainfall or that may be sent to market in seasons when they are not available elsewhere; or (3) the production of larger crops of such high-priced products as can bear the cost of transportation to the general markets of the country."

Methods and cost of making subdivision on topographical survey for Sunnyside unit, Yakima project, U. S. Reclamation Service, W. E. Whittier (*Engin. and Contract., 37 (1912), No. 24, pp. 669–674, figs. 2*).—A complete discussion of the resurvey, revision, and extension of the distribution system of this project, containing about 102,000 acres.

Irrigation and reclamation, S. McIntosh (*Jour. Dept. Agr. So. Aust., 15 (1912), No. 8, pp. 806–813*).—A brief outline of the history of irrigation in South Australia with a list of the existing and prospective irrigation and reclamation areas.

Triennial irrigation revenue report of the Bombay Presidency (excluding Sind) for the triennium ending 1910–11 (*Trien. Irrig. Rev. Rpt. Bombay Pres., 1910–11, pp. IV+145, pls. 3*).—This report contains statistical information, compares the results of successful triennial periods, shows the progress of irrigation works, and gives a detailed list of the works.

Economic value of drainage, A. D. Wilson (*Farmer, 31 (1912), No. 25, p. 835, fig. 1*).—The author gives figures to show that tile drains, if properly and permanently constructed, will pay back the principal and interest on an average acre in 5 years. In this connection he discusses the requirements of a good outlet, available capital, and competent engineering services.

Construction and maintenance of open ditches, G. P. Smith (*Proc. Iowa Engin. Soc., 24 (1912), pp. 89–93*).—The proper construction and subsequent maintenance of open drainage ditches are dealt with, emphasizing the need of correct design and location, with special reference to cross section and grade, and of careful construction with respect to side slopes, berms, and waste banks.

Ditching by horsepower, J. C. Scheid (*Ind. Farmer, 67 (1912), No. 26, p. 1*).—These are notes as to the work done by a horsepower ditching machine for tile drainage. It is stated that an average of 300 rods of ditch can be cut in a day and 75 rods of tile laid, at an average cost of from 3 to 3½ cts. per rod for both operations, thereby effecting a saving of from 15 to 20 cts. per rod as compared with contract work.

Some experiments with the curing of tile, G. P. Dieckmann (*Cement and Engin. News, 24 (1912), No. 7, p. 207*).—The results of a series of experiments to determine the best method of curing cement tile are given, the experiments being made on machine-made tile 8 by 12 in. by 1 in. thick, having an average weight of 24 lbs., the mixture being 1 part cement to 3½ parts sand. The tile were subjected to different treatments, such as curing in air, immersion in hot and cold water for various periods, and steam curing under varying pressures

and for different time periods, and each tile after curing was subjected to the pressure test.

The conclusions from the experiments were as follows: The curing of tile in exhaust or moisture steam for 36 or 48 hours respectively gives the best results, after which no sprinkling or wetting is necessary; 8-in. tile, cured in exhaust steam for 3 days, tested 2,000 lbs. after being 7 days old, showing that two-thirds of the total strength can be developed in 7 days, the highest crushing strength obtained being 3,000 lbs. The curing of tile in air alone is unsatisfactory, although it is materially helped by sprinkling.

How the engineer may help to prevent troubles from defective drain tile, A. O. ANDERSON (*Engin. and Contract., 37 (1912), No. 25, pp. 705, 706*).—A prevailing neglect among drainage engineers is claimed as to the testing of drain tile and in the making of strict specifications for their strength and the materials of their manufacture. The importance of careful design of tile lines is pointed out, and the general principles of earth pressure in their connection with the size and thickness of tile is discussed. The formula for tile design $T=\sqrt{\frac{RSF}{12M'}}$ in which T=the thickness in inches, R=radius in inches, S=the load in pounds per foot, F=factor of safety for earth pressure, and M=the modulus of rupture in tile in pounds per square inch as determined by test, is presented.

A summary is given of the duties of the engineer relative to computing and specifying the depth and width of ditch, allowable loading, modulus of rupture, thickness, absorption, and materials of manufacture for the different sizes of the tile in a drainage system.

Assessment of benefits in drainage districts, I. W. HOFFMANN (*Proc. Iowa Engin. Soc., 24 (1912), pp. 78–80*).—The author points out certain factors to be considered in making drainage district assessments, such as the kind of land, such as swamp, wet, low, and high, the distance of the different tracts from the proposed drain, the elevation of each tract above its drainage outlet, and actual tile benefits from laterals.

Supplemental report on Nelson Avenue experimental road, and report of experiments in binding gravel and crushed gravel with tar and asphalt, and also in constructing a waterbound road of gravel, J. C. WONDERS (*Ohio Highway Dept. Bul. 13, 1910, pp. 19, figs. 17*).

The physical testing of rock for road building, including the methods used and the results obtained, A. T. GOLDBECK and F. H. JACKSON, Jr. (*U. S. Dept. Agr., Office Pub. Roads Bul. 44, pp. 96, figs. 20*).—This bulletin, in part a revision of Bulletin 79 of the Bureau of Chemistry, previously noted (E. S. R., 15, p. 826), discusses the agencies destructive of roads and the necessary physical and mechanical qualities of the road materials, describes in detail the physical tests of road material as conducted in the Office of Public Roads, which include the hardness, toughness, impact, abrasion, cementation, specific gravity, and absorption tests, and briefly interprets the results of these tests in general on trap, limestone, dolomite, granite, sandstone, chert, gneiss, schist, slate, marble, and quartzite. As an appendix a large amount of data is given of the results of physical tests made on rock samples classified according to their location and showing availability and character of the materials as far as they have been tested throughout the United States.

Making better country roads, C. W. BUSH (*Wis. Country Mag., 5 (1911), No. 11, pp. 437–439, figs. 2*).—The claim is presented that macadam, telford, and dirt roads are the best country roads, and brief directions for their proper construction and maintenance are given.

Effect of country roads (*Missouri Bd. Agr. Mo. Bul., 10 (1912), No. 5, pp. 60, figs. 24*).—This bulletin points out the social and commercial advantages of

good roads to rural life in Missouri, deals with general road administration, and discusses the tractive resistance of roads in its relation to height of wheel, width of tire, and general form of wagon, indicating that 6 in. is the best width of tire for a combination farm and road wagon, and that the best form of all-round farm wagon is one with axles of equal length, broad tires, front wheels from 30 to 36 in. high, and rear wheels from 40 to 44 in. high.

Final report on the work of the highway division of the Maryland Geological Survey, 1898–1910, W. B. CLARK (*Md. Geol. Survey [Rpt.], 9 (1911), pp. 81–96*).—This report briefly reviews the condition of roads in the State and the best means for improving them, the classification and distribution of road building materials of the several counties, road surveys for the preparation of plans and cost estimates of road improvement, free technical advice to towns and counties, and the state aid highway law, and gives a summarized financial statement.

Fourth and final report on state highway construction, W. W. CROSBY (*Md. Geol. Survey [Rpt.], 9 (1911), pp. 97–120*).—A report on the physical and financial conditions of roads in Maryland from 1898 to 1910, including tabulated data of road mileage and cost. During the 12 years, the total expenditure on highway improvement and construction amounted to $506,342.04.

Highway construction in the State of Washington by convict labor, F. A. KITTREDGE (*Engin. and Contract., 37 (1912), No. 26, pp. 722–726, figs. 18*).—This article notes that convict labor is being used to great economic advantage in Washington on highway construction, and describes in detail the construction of a rock road on the Columbia River. A cost estimate is given showing a saving of $82,264.84, or $3.69 per day per man, through the use of convict labor.

State control of highway bridge construction (*Engin. News, 67 (1912), No. 24, pp. 1137, 1138*).—Attention is called to the frequent incompetency among county highway commissioners for letting highway bridge contracts and overseeing construction, pointing out the evils of the present system, employed more especially in the middle western States, of leaving design, specifications, contract, and construction entirely to the contractor, and noting the aversion of the average county commissioner to incurring the additional expense of employing a competent engineer. As a remedy, the plan is advocated of supervision by state engineer's office of all highway bridge design and construction.

The agricultural motor contest at Chelles, L. FOURNIER and L. W. ELLIS (*Sci. Amer. Sup., 73 (1912), No. 1904, pp. 407–411, figs. 14*).—This is a comparison of European and American machines, giving a description of each machine and general conclusions as to their good and bad points, and indicating the advantages of the endless chain as a traction mechanism.

Manure spreader with moving box bottom (*Maschinen Ztg., 10 (1912), No. 11, pp. 130, 131, figs. 5*).—A description of a manure spreader which has rotating parts in the box bottom which shake up the manure and pass it down to a grating below, through which it is pressed to be scattered over the field by flapping boards. This machine presents the advantages of simplicity in its working parts, making it easy to dismantle and clean, and durability, as its principal working parts and bearings are forged steel instead of castings.

The first electric plow in Spain, R. GOIZUETA (*Prog. Agr. y Pecuario, 18 (1912), No. 771, pp. 275–279, figs. 5*).—An electric plowing system is described consisting of a transmission line, 2 transformers, 2 motor cars, and a balance-plow operated by motor-driven windlasses on the motor cars. The cars advance for each new furrow. The current is supplied at 10,000 volts pressure and is reduced by the transformers to 750 volts for distribution.

Motor-driven grubbing machines (*Bl. Zuckerrübenbau, 19 (1912), No. 9, pp. 140–143*).—A general discussion of the use of animal, steam, electric, and internal combustion engine power in agriculture, favoring the last, is followed

by a description and the results of trials of 3 gas engine-driven grubbers for use in sugar-beet cultivation. Each of these is said to present a good combination of stationary and portable motors for general farm use, and in spite of rain and heavy soil gave fair satisfaction in the trials.

A new way to handle corn fodder, T. F. WILLOUGHBY (*Weekly Impl. Trade Jour., 26 (1912), No. 27, pp. 24, 26, figs. 2*).—An account is given of the use of a hay press for bailing corn fodder direct from the shock, in a case in which a corn shredder was not available. On opening the bales the fodder was found to be crushed and broken up in excellent condition for feeding, due to the shearing effect and tremendous pressure of the plunger. This is thought to present a solution to the problem of utilizing corn fodder in cases where the corn crop is not large enough to justify the purchase of a shredder, and where there is not enough business to make custom shredding profitable. The machine used was a small hay press on trucks with a gasoline engine. The engine may be detached, put on other trucks, and used for belt and shaft work around the farm, making in all a handy device and profitable investment for the small farmer.

The trials of potato diggers and potato sorters, W. C. BROWN (*Jour. Roy. Agr. Soc. England, 72 (1911), pp. 243–252, figs. 5*).—The results of trials of 7 potato diggers and 6 potato sorters are given and their strong and weak points noted. The decision of the judges favored a digging machine with 4 digger arms revolving behind the share to which are fitted 3 specially curved tines which dig and deposit the potatoes with a peculiar feathering action. This is a light machine built largely of wrought steel and malleable iron, and has a low draft and a silent and steady working motion which is helped by the 5:1 bevel gears running enclosed in an oil bath.

The hydraulic ram, W. C. DAVIDSON (*Breeder's Gaz., 61 (1912), No. 21, p. 1194, fig. 1*).—Brief instructions are given for the installation and operation of a hydraulic ram.

Making use of the siphon on the farm, L. J. WRIGHT (*Wis. Country Mag., 6 (1912), No. 5, pp. 15, 16, fig. 1*).—An outline of the method and requirements for using a siphon for conveying water from a well to a stock tank.

Electric lighting plants for the farm (*Farm Machinery, 1912, No. 1082, pp. 16, 17*).—A general discussion of the electric lighting systems most economical and efficient for the average large and small farm, outlining the method of computing the necessary lighting capacity of a plant and the methods of determining the apparatus necessary to supply the computed lighting energy. It is stated that for an average small farm $250 will buy a 25-light plant, consisting of one 25-light, 40-volt dynamo, 1 switch board equipped with motors and switches, and one 16-cell, 120-ampere hour storage battery with fittings and electrolyte. This plant requires a 1½-horsepower or larger, steadily operating engine for good service.

An investigation into the value of ferro or reenforced concrete for farm and estate purposes, C. S. ORWIN (*Jour. Roy. Agr. Soc. England, 72 (1911), pp. 122–139, figs. 10*).—A discussion of the use of reenforced concrete on the estates in England for the construction of farm buildings, farm laborers' cottages, and other farm equipment. The details of construction of several typical examples are given, including some original ideas as to reenforced column and wall construction for buildings, and demonstrating the ease and cheapness with which concrete work can be done on the farm by comparatively unskilled labor and 1 or 2 good foremen.

The latest in circular barn construction, H. C. CROUCH (*Ill. Agr., 16 (1912), No. 9, pp. 309–313, figs. 3*).—The advantages of circular barns pointed out are convenience, strength, durability, and cheapness. The details of construction of a typical barn, which cost about $2,000, are briefly presented.

The construction of cow-byres, W. S. H. Cleghorne (*Agr. Jour. Union So. Africa, 3 (1912), No. 3, pp. 372–382, figs. 7*).—The principles of the external and internal design and construction of single and double cow sheds are presented. The objects emphasized as to be kept in view are cleanliness, ventilation, lighting, comfort and health of cows, and economy of labor.

An improved roof for the cow house, R. Henderson (*Trans. Highland and Agr. Soc. Scot., 5. ser., 24 (1912), pp 77–86, figs. 9*).—The author points out the unsanitary features of the wooden or tile roof supported on a framework of wooden struts and rafters, and recommends and gives the details of construction of a nearly flat reenforced concrete roof supported by small steel girders. This construction presents a minimum resistance to air circulation and a minimum surface for the settling of dust and other unsanitary matter, and makes good ventilation and lighting possible.

Ventilating the cow barn, J. H. Grisdale (*Canad. Thresherman and Farmer, 17 (1912), Nos. 5, pp. 55–58, figs. 7; 6, pp. 53–57, figs. 8*).—Some notes and observations are given on stable ventilation in general, with specific information as to the ventilation requirements of a given dairy stable and illustrated instructions for the installation of a suitable system.

A modern granary, J. E. Bridgman (*Farm and Ranch, 31 (1912), No. 23, p. 11, fig. 1*).—Plans are given showing the construction of a granary and the location of equipment, the whole costing $1,350.

Cement stucco silo, J. W. Hart (*South. Agr., 42 (1912), No. 13, pp. 10, 11*).—A bill of materials and the details of construction of a 12 ft. by 28 ft. cement stucco silo are given. This type of silo presents the qualities of strength, durability, cheapness, and neat appearance.

Residential sewage disposal plants, W. H. Booker (*Bul. N. C. Bd. Health, 27 (1912), No. 4, pp. 146–156, figs. 7*).—The author deals with the design, construction, and operation of small sewage disposal plants for isolated residences having not over 10 or 12 occupants, presenting the principles of purification by bacterial action in both the settling tank and filter bed or absorption area, and discussing surface sewage irrigation. He bases his design on an average daily flow of sewage per person of about 35 gal., and a size of septic tank to contain not over from 18 to 36 hours sewage flow for proper bacterial action.

RURAL ECONOMICS.

Monographs on agricultural cooperation in various countries (*Internat. Inst. Agr. [Rome], Bur. Econ. and Soc. Intel., Monographs Agr. Co-oper., 1 (1911), pp. XVI+451*).—This is a revised edition of a publication previously noted (E. S. R., 24, p. 795). It presents notes and statistics on agricultural cooperation in various countries, including the following subjects: Historical and Statistical Sketch of the Present State of Agricultural Cooperation in Germany, Cooperative Land Credit Societies in Germany, and Present Conditions of Noncooperative Agricultural Associations; a General Sketch of Agricultural Organization in Belgium, Technical Work of the Professional Unions, Commercial Action of Professional Unions, Credit, and Cooperative Insurance; Cooperative Dairies, Cooperative Bacon Factories, Societies for Purchase and Sale, and Live Stock Improvement in Denmark; Historical Sketch of Agricultural Cooperation in British India, and The Cooperative Movement in 1908–9; Present State of Agricultural Unions in France, and Statistics Relative to Agricultural and Credit Cooperation; Noncooperative Agricultural Societies in the United Kingdom, Agricultural Cooperation in Great Britain and Ireland, Relations between the Agricultural Cooperative Movements in England, Scotland, and Ireland; Agricultural Cooperation and Associations in Norway, Holland, Russia, and Sweden.

Each of the monographs is preceded by demographic and economic statistics which serve as a general introduction to the study of each country.

A cooperative dairy association, W. M. REGAN (*Col. Farmer [Univ. Missouri], 9 (1912), No. 5, p. 17*).—This article presents a concrete illustration in the Ozark Dairy Association near Springfield, Mo., of the possibilities of cooperation among farmers. When the association was started 5 years ago, the farmers were getting for their butter fat 6 cts. below the Elgin price, while last year the association sold for its 700 members $320,000 worth of butter fat at an average of only 2 cts. below the Elgin price, and obtained 8 cts. per pound more last winter than nonmembers were receiving. This meant an increased profit of $103 per member.

Selling for more and buying for less, J. ALVIN (*Country Gent., 77 (1912), No. 27, pp. 4, 5, 20, figs. 2*).—This article describes in detail the organization and work of the Monmouth County Farmers' Exchange of New Jersey, which began operations in 1908 with a capital of $7,000 and 350 members, by both buying and selling for its members. "In 1911 it did a business of $1,499,500.99, saved its members over $125,000, and made net profits of $17,496.51." The capital stock for 1912 is reported at $75,000, a surplus of $25,000, and the membership at 1,100. The cost of administration is said to be 1½ per cent of the total business.

It is suggested that in such cooperative enterprises it is highly important that (1) farmers have sufficient products to permit of business on a considerable scale, (2) there should be some leading crop as the mainstay of the undertaking, and (3) the administration should be in the hands of men familiar with markets and marketing conditions. Much of the success of this enterprise is attributed to the charter requirement that all stockholders must ship through the exchange unless they receive at least 5 per cent more from outside competitors.

Relation between the farmer and the railroad, H. ELLIOTT (*Fargo, N. Dak., 1912, pp. 19*).—An address at the Tri-State Grain and Stock Growers Association, Fargo, N. Dak., January 17, 1912, in which the speaker discusses the history and growth of agriculture, and emphasizes the importance of making farming more than ever a business, increasing production to meet the increasing population, and establishing a sentiment and demand for more scientific methods of farming. He points out the economic significance of the interrelation of farming and railroading and illustrates their interdependence.

Government aid to small farmers, R. FLEMING (*Daily Cons. and Trade Rpts. [U. S.], 15 (1912), No. 137, pp. 1044, 1045*).—This report notes that the small landholders act of the Scottish Parliament, which became operative April 1 last, constituted a board of agriculture and a Scottish land court, each with distinct powers to facilitate the establishment of new agricultural holdings, and since April 1, more than 3,000 applications for registration as small landholders have been received. In case the landholders do not meet the demand by leasing small tracts to applicants on satisfactory terms, the board is authorized, upon payment of compensation for surface damage, etc., to provide by compulsory proceedings suitable land in each district sufficient to meet the demand of applicants. The board also has an annual grant not exceeding £200,000 to provide assistance to landholders, by way of a loan or gift as circumstances may warrant, for dividing, fencing, and draining lands, and erecting dwelling houses or other farm buildings.

The small holdings movement (*Economist, 75 (1912), No. 3594, pp. 59, 60*).—The progress of the small holdings movement in Great Britain since the passage of the 1908 act, is deemed fairly creditable, despite numerous complaints and criticisms.

Up to the end of 1911, 124,502 acres had been acquired for small holdings by county councils in England and Wales, of which 78,871 acres had been

purchased for £2,493,121, and 45,631 acres leased for rents amounting to £55,637. Of these, 94,154 acres had been let to 6,916 small holders, 186 acres sold to 13 small holders, and 4,597 acres let to 39 cooperative small holdings associations, which sublet the land to 732 of their members. Other applicants have been provided with land by private landowners, mainly through the instrumentality of the councils, making a total of 12,529 who have been provided with land.

Applications were received during 1911 from 4,301 individuals and 27 associations, of which 2,544 of the individuals and 16 associations have been provisionally approved for a total of 43,338 acres. During the 4 years since the act came into operation applications have been received from 35,187 individuals and 61 associations, for a total of 584,802 acres. Only 2.12 per cent of the applicants expressed a desire to purchase holdings.

Agricultural credit and its benefit to the colonies, A. ZIMMERMANN (*Rev. Écon. Internat., 9 (1912), II, No. 2, pp. 281–295*).—This article discusses at length the problem of agricultural credit, the relation loans on mortgages, agricultural credit banks, and mutual cooperative organizations bear toward its solution, and how the systems as adopted by France, Germany, England, and Holland have affected the agriculture and the farmer in those countries.

Rural credit banks (*Rural World [London], 24 (1912), No. 783, p. 128*).—The author maintains that the establishment of these banks in England and Wales "has evidently not only added to the prosperity of many of the villagers, but has stimulated neighborly feeling by showing men how they can help their fellows by the exercise of care and mutual trust, without any real pecuniary risk to themselves, has encouraged thrift and efficient methods of cultivation, and has at the same time increased the self-respect of the individual members, and inspired them with hopes of progress."

Seasonal distribution of labor on the farm, W. J. SPILLMAN (*U. S. Dept. Agr. Yearbook 1911, pp. 269–284, figs. 6*).—This article presents a study as to the labor requirements of different crops and farm operations, looking to the formation of working plans that will secure a more economic use of the time of the farmer, his laborers, and his work stock. The possibility and expediency of planning cropping systems which will give regular employment to labor and thereby increase the area of land which a man or a definite number of men can farm are pointed out and emphasized, as well as some of the difficulties encountered. It is noted that when the farmer conducts some other industry in which the labor may well be intermittent, such as quarrying, mixing fertilizers, grinding agricultural lime, clearing land, cutting railroad ties, and the like, he may disregard the distribution of labor in planning a system of management, and devote his land only to those crops which are most profitable, but in doing this he must still take into account the cost of keeping idle horses and must plan a system of soil management that takes account of the future productivity of his land.

Charts are given illustrating the distribution of man and horse labor for each month of the year on field crops on a New England dairy farm, a New York potato and bean farm, a Dakota grain farm, and a general farm in the Middle West. A detailed work schedule of field labor on 240 acres of crops consisting of corn, wheat, hay, and an estimated seasonal requirement and distribution of labor necessary to produce 80 acres each of corn, of wheat, and of timothy and clover hay in a 6-year rotation in the latitude of central Missouri are also presented.

Agricultural opportunities (*U. S. Dept. Com. and Labor, Bur. Immigr. and Nat. Agr. Opportunities, 1912, Nos. 1, pp. 32; 2, pp. 36; 3, pp. 23; 4, pp. 32; 5, pp. 36; [6], pp. 32; [7], pp. 32*).—These publications present information concerning physical characteristics, resources, and products of the various States of the

United States, together with Alaska and Hawaii, special attention being given to principal crops grown, prices of farms, climate and soil, stock raising, etc.

[A tour through the cotton belt of the U. S. A., 1911], G. S. HENDERSON (*Agr. Jour. India, 7 (1912), No. 2, pp. 175–190, pls. 10*).—This article presents notes gathered on a tour through the cotton belt of the United States in 1911, showing that the yield of cotton for the last 10 years has varied from 9,500,000 bales to over 13,000,000 bales, and the price per pound of lint from 8 cts. to over 14 cts., while the price of Egyptian cotton has fluctuated between 3.8 and 5.3 cts. Observations are also made as to the types of soil and cultural methods in different States, significance of insect pests and diseases of cotton, the use of farm machinery, the tendency after the civil war for the large plantations to be broken up and cultivated by small landowners or tenants, systems of tenancy, and the tendency of corporations or syndicates to purchase and operate very large areas.

Cotton production, 1911 (*Bur. of the Census* [*U. S.*] *Bul. 114, pp. 61, figs. 14*).—A census report presented under the following heads: "(1) Annual cotton production in the United States, as returned by ginners and delinters, distributed by States and counties, from 1907 to 1911, inclusive, with statistics of production for previous years; (2) world's cotton production from 1907 to 1911, by countries; and (3) supply and distribution of cotton in the United States for specified periods, 1909 to 1912, inclusive."

The quantity reported for the year with linters included and round bales counted as half bales was 16,109,349 running bales, the largest crop ever produced, 5,934,894 bales more than in 1909, and 2,570,322 bales more than in 1904.

[Live stock on farms and elsewhere in the United States] (*Bur. of the Census* [*U. S.*] *Bul. 13, pp. 34, figs. 6*).—This bulletin presents the principal results of the enumeration of live stock in the United States by the last census, including the totals both by geographic divisions and by States, and summarized as follows:

Number of domestic animals on farms and elsewhere in the United States in 1910 and 1900, their value in 1910, and other data.

	All domestic animals.	All cattle.	Dairy cows.	Horses, mules, asses, and burros.	Swine.	Sheep.	Goats.
Number in 1910:							
On farms	.....	61,803,866	20,625,432	24,148,580	58,185,676	52,447,861	2,915,125
Not on farms	.....	1,878,782	1,170,338	3,469,662	1,287,960	390,887	114,670
Number in 1900:							
On farms	.....	67,719,410	17,135,633	21,625,800	62,868,041	61,503,713	1,870,599
Not on farms	.....	1,616,422	973,033	3,126,636	1,818,114	231,301	78,353
Value in 1910:							
On farms	$4,760,060,093	$1,499,523,607	$706,236,307	$2,622,180,170	$399,338,308	$232,841,585	$6,176,423
Not on farms	$536,361,526	$60,816,261	$47,001,623	$463,280,313	$10,076,260	$1,822,943	$365,749
Average value per head, 1910:							
Total	.....	$24.50	$34.56	$111.72	$6.88	$4.44	$2.16
On farms	.....	$24.26	$34.24	$108.59	$6.86	$4.44	$2.12
Not on farms	.....	$32.37	$40.16	$133.52	$7.82	$4.66	$3.19
Farms and inclosures reporting:							
Farms	6,034,783	5,284,916	5,140,869	.....	4,351,751	610,894	82,755
Barns and other inclosures not on farms	2,013,563	899,346	867,226	.....	347,936	6,140	23,745

Final report on grain crops and live stock of the Province of Saskatchewan (*Saskatchewan Dept. Agr. Bul. 29, 1912, pp. 30, pl. 1*).—As compiled from returns by individual farmers and the department's regular staff of crop correspondents, the total production for the year 1911 of wheat, oats, barley, and flax was 212,710,363 bu. or 67,825,513 bu. over the previous year. This was grown on 8,602,455 acres, an increase of 1,220,390 acres over 1910.

The number of live stock in the Province was as follows: Horses 574,972, milch cows 231,297, other cattle 546,205, sheep 125,072, swine 333,218, and poultry 4,643,858, all being largely increased over 1901.

Report of the department of agriculture and immigration for the year ending December 31, 1911 (*Rpt. Dept. Agr. and Immigr. [Manitoba], 1911, pp. 113*).—The considerable increase in the output of agricultural products in Manitoba for 1911 over previous years is shown in the following table:

Acreage and yield per acre of crops in Manitoba for a period of years.

Crops.	Acreage.					Yield per acre.				
	1890	1895	1900	1905	1911	1890	1895	1900	1905	1911
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*
Wheat	746,058	1,140,276	1,457,396	2,643,588	3,339,072	19.65	27.86	8.9	21.07	18.29
Oats	235,534	482,658	429,108	1,031,239	1,628,562	40.2	48.73	20.5	42.6	45.3
Barley	66,035	153,839	155,111	432,298	759,977	31.33	36.69	18.9	34.2	31.5
Flax	.....	82,668	20,437	24,707	85,836	.....	15.5	8.04	13.02	14.0
Potatoes	.....	.....	16,880	25,835	44,478	.....	.....	132.0	187.0	187.0

Poultry disposed of by farmers during the year numbered 941,776; farm buildings constructed were valued at $3,273,487; butter marketed by farmers amounted to 4,547,827 lbs. at an average of 21.4 cts. per pound; and live stock in the Provinces numbered 251,572 horses, 407,611 cattle, 37,227 sheep, and 192,386 pigs.

Agricultural statistics, 1911 (*Bd. Agr. and Fisheries [London], Agr. Statis., 46 (1911), No. 3, pp. 188–274, fig. 1*).—This report shows by notes and tables the prices and quantity of wheat, corn, barley, oats, live stock, and other agricultural produce in Great Britain in 1911.

[Agricultural review of Hungary], P. NASH (*Daily Cons. and Trade Rpts. [U. S.], 15 (1912), No. 152, pp. 1381–1391*).—The grain crop of 1911 is reported at 576,639,000 bu., some 3,000,000 bu. less than in the preceding year. Decreases are also noted in the potato, sugar beet, and tobacco crops. The production of wine was 105,668,000 gal. as compared with 60,750,000 gal. in 1910. The number of cattle is increasing, but not sufficiently to meet the demand, and imports of meat and butter are necessary.

The formation is noted of the National Union of Hungarian mortgage banks, planned to assist small farmers by buying large estates, dividing them into small parcels, and selling them on extremely easy terms. The bank also loans money to farmers for investment on their farms to be repaid in small annual sums for periods ranging from 20 to 40 years. The bank is capitalized at $3,045,000, of which the government furnishes $1,624,000.

Roumanian agricultural statistics, J. B. JACKSON (*Daily Cons. and Trade Rpts. [U. S.], 15 (1912), No. 138, p. 1084*).—Data are reported for the principal crops. "Roumania's agricultural production in 1911 had a total value of $269,042,000, which was $17,273,500 more than in 1910. Cereals made up about 83 per cent of the total."

[Production statistics in Australia], G. H. KNIBBS (*Commonwealth Bur. Census and Statis. Melbourne Prod. Bul. 5, 1912, pp. 9–48*).—This bulletin presents notes and tables dealing with production statistics of Australia and contains particulars relative to land settlement; number and area of private holdings; acreage, yield, and value of each of the principal crops in the several States for a period of years; value of implements and machinery employed in agriculture, dairying, and pastoral holdings; quantity and value of agricultural products imported and exported, 1901–1910 inclusive; number of live stock, estimated production, and value; and quantity and value of principal farmyard and dairy products, bee and poultry products, etc.

Prerequisites for the agricultural development of Ugogo in German East Africa, P. VAGELER (*Tropenpflanzer, Beihefte, 13 (1912), No. 1–2, pp. VII+127, pl. 1, figs. 18*).—This is an account of studies of the topographical, climatic, hydrographic, soil, and agricultural conditions of Ugogo, a small district near the central part of German East Africa.

The soils of the region naturally group themselves into red and gray types, the latter covering about 94 per cent of the area. The residual red soils occupy the more broken ridges, and the alluvial formations the small stream bottoms. The red soils are said to be rich in lime, potash, and humus, but poor in phosphoric acid and nitrogen. The residual gray soils occupy the higher level hilltops and the plateaus. The alluvial gray soil is found in the swampy regions. The gray soils of the plateaus constitute the most widely distributed type. They are poor in plant food constituents. The gray alluvial is much more fertile than the residual type.

Grain and live stock production constitute the principal agricultural industries. The author believes that this region offers opportunities for colonial development, and recommends the utilization of underground waters, a thorough study of the climatic conditions, the establishment of an agricultural experiment station, and the breeding of animals adapted to the climatic conditions.

AGRICULTURAL EDUCATION.

Agricultural college and economic aspects of farming, J. W. PINCUS (*[Amherst, Mass., 1912], pp. 4*).—In this address, delivered before the students of the Massachusetts Agricultural College, May 20, 1912, the author points out the importance to the farmer of the problems of cooperation, improvement of agricultural credit, and social life, and suggests how the agricultural college and its graduates may become potent factors in the rejuvenation of country life.

The commercial side of farm education, A. M. LOOMIS (*Tribune Farmer [N. Y.], 11 (1912), No. 546, p. 18*).—It is brought out in this article that the lack of money to carry out and put into practice the ideas and methods advocated at agricultural schools and colleges for increasing the fertility of the farm and growing better crops emphasizes the need of special instruction for financing and marketing crops. It is necessary to teach the farmer how to increase the yield of his land, but it is equally important for him to know how to make his farm products yield the greatest possible profits.

Education for the Iowa farm boy, H. C. WALLACE (*Des Moines, Iowa, [1911], pp. 28*).—In this paper, read before the Prairie Club of Des Moines on December 17, 1910, the author outlines the agricultural conditions leading to the need for better farming and larger crops, and in consequence the importance to the Nation of the education of the farmer. The paper considers what has been and is now being done to educate the future farmers; compares general methods of education followed in Germany, France, and England with those followed in America; deals with secondary agricultural education in foreign countries and the United States; and reviews agricultural education conditions in Iowa.

Some needs in forestry education, H. P. BAKER (*Forestry Quart., 10 (1912), No. 1, pp. 45–49*).—This is a discussion as to whether our courses in forestry should be strengthened along lines of natural science or engineering.

"The fact that all men from either 4 or 6 year courses have been placed upon nearly the same basis upon entering practical work has produced an attitude, a condition . . . which must be changed somewhat before the problem of filling the gap between the practically untrained guard and ranger of today and the technical assistant is solved." A solution suggested at the recent conference of forest schools in Washington "is the establishment of a series of well-equipped ranger schools giving from 2 to 3 years of intensely practical work and fitting men for work in specific regions rather than for the entire country." Or it might be agreed "that the function of the undergraduate forest school is a training especially strong in civil and mechanical engineering, that the graduates may fit immediately into such work as reconnoissance surveying as practiced in the National Forests, or estimating and surveying as now carried out in the Appalachians, or the planning and carrying out of logging operations; . . . that a man so trained and with a bachelor's degree only should not be called a forester until he had taken 1 or 2 years of advanced work in technical forestry, after a year or two of experience."

In public high schools should agriculture be taught as agriculture or as applied science? W. R. HART (*Yearbook Nat. Soc. Study Ed., 11 (1912), pt. 2, pp. 91–97*).—The author assumes that agriculture may be taught in either of these ways, but concludes that because of time limitations and desirability of maintaining human interest, the former is to be preferred.

In the public high schools agriculture should be taught as agriculture, not as applied science, G. F. WARREN (*Yearbook Nat. Soc. Study Ed., 11 (1912), pt. 2, pp. 98–101*).—The author emphasizes the fact that agriculture is too new and rapidly growing a science to be best taught by having the principles presented in the separate sciences. To keep all the science text-books emphasizing agriculture up to date would be an impossible task, and further, "our text-books of science are not written by persons who know much about agriculture." The sciences are also of world-wide application, whereas certain phases of agriculture are essentially local in their pedagogy. Another reason advanced is that "our teachers of science are not likely ever to know enough about agriculture to be able to go very far with the introduction of agriculture into the sciences."

The author holds that agriculture is an independent science in itself, as independent, for example, as medicine, where "we should not think of expecting the teachers of botany, zoology, chemistry, and physics to train physicians." Illustrations are given to show that trying "to give agricultural training without agriculture as a separate subject is like Hamlet with Hamlet left out."

Potentiality of the school garden, C. A. STEBBINS (*Addresses and Proc. Nat. Ed. Assoc., 49 (1911), pp. 1131–1137*).—An address delivered before the National Education Association at San Francisco, in which the author points out the possibility of the school garden to give new direction to old subjects and create a sentiment for farming, for country life, and to link together school life and community life generally. This is done, as he suggests, by making the garden what might be called an embryo community, where children may be brought naturally in contact with those factors which they are to meet later in life. Here the child may have demonstrated to him, through primitive methods of farming, marketing, banking, etc., the civic evolution of his race, and at the same time be brought in contact with the activities of the world; for example, flax may be grown, later the fiber may be separated and used in weaving; from this may be brought out lessons as to the world's work in clothing its people.

It is stated that the school garden further offers opportunities for forming a correct social personality early in life. "Early in their garden life the children learn to respect those things that belong to their neighbors; to realize that community property belongs to the whole, not to a part, but that each must offer his support; to understand that the policy which is the best for the majority must be supported . . . to feel, in general, that each represents but one small part of a great whole and that each must do his best to fit in smoothly."

City congestion and farm desolation, J. KRAUSKOPF ([*Doylestown, Pa.: Nat. Farm School, 1911*], *pp. 20, figs. 2*).—In this address the Ghetto conditions in New York City are described and the need of more institutions like the National Farm School at Doylestown, Pa., to help prepare immigrants for life on the farm is emphasized.

Popular farm education in Canada, A. FULLERTON (*Country Gent., 77 (1912), No. 22, pp. 3, 31, figs. 3*).—The author describes some of the work of the Ontario Agricultural College, particularly those features relating to the education of adult farmers, including excursions to the college, short courses, and the appointment of graduates of the college as farm advisers. In 1911, 20 counties were supplied with farm advisers.

Agricultural education in Trinidad—past, present, and future, A. FREDHOLM (*Proc. Agr. Soc. Trinidad and Tobago, 12 (1912), No. 4, pp. 96–103*).—An account is given of the development of agricultural instruction in Trinidad. Instruction in agriculture is included in the curriculum of the public schools, with school gardens for practical demonstrations, and a system of apprenticeships.

Eleventh annual general report of the Department of Agricultural and Technical Instruction for Ireland (*Dept. Agr. and Tech. Instr., Ireland, Ann. Gen. Rpt., 11 (1910–11), pp. VI+518*).—This is a report on the department's administration and funds and on the details of its work during 1910–11, including agricultural and technical instruction, and presents data corresponding to the report for the previous year (E. S. R., 25, p. 494).

Itinerant schools of agriculture for young women (home economics) and for young men, J. M. GUILLON (*Bul. Mens. Off. Renseig. Agr. [Paris], 10 (1911), No. 6, pp. 711–736*).—The author discusses in detail the origin, aim, organization, instruction, and budget of these schools.

Agricultural schools, U. BRANDER (*Fennia: Bul. Soc. Geogr. Finlande, 30 (1910), pt. 2, Carte 33, pp. 14–25*).—This is a historical review of the establishment of agricultural schools in Finland. It shows that in 1910 the following 129 institutions received government aid for agricultural instruction: A section of agriculture at the University of Helsingfors; an agricultural institute at Mustiala; an agricultural high school at Kronoborg; an agricultural lyceum at Helsingfors; 9 agricultural schools with 2-year courses, 1 with a 1½-year course, and 1 with a 1-year course; 2 farm schools with 2 winter courses, and 16 with 1 winter course; 6 itinerant farm schools extending through 2 months; 12 public high schools offering agricultural instruction; 5 gardening schools; 10 horticultural and home economics schools; 8 home economics schools; 4 theoretical animal husbandry schools; 4 animal husbandry and dairy schools; 3 2-year, 31 1-year and 1 itinerant animal husbandry schools, 3 theoretical dairy schools; 1 1-year dairy school; 2 schools for grooms; 5 farriery schools; and 1 school of apiculture. A brief bibliography is appended.

Agricultural education [in Victoria], A. M. LAUGHTON (*Victorian Yearbook, 31 (1910–11), pp. 623–639*).—A brief summary of the work and progress of each of the agricultural colleges, schools, and experiment stations in Victoria is here presented.

Elements of agriculture, W. FREAM (*London, 1911, 8. ed., pp. XIII+692, pls. 18, figs. 270*).—This text-book, prepared by authority of the Royal Agricultural Society of England, was edited and revised in the eighth edition by J. R. Ainsworth-Davis. It consists of 3 parts: (1) The soil, including chapters on formation, composition and classification, physical properties, sources of loss and gain, improvement and tillage of soils, agricultural implements, and manures and manuring; (2) the plant, including chapters on seeds and their germination, structure and functions of plants, cultivated plants, weeds, selection of seeds, grass land and its management, farm crops, hardy fruit culture, and fungus pests; (3) the animal, including chapters on structure and functions of farm animals, composition of the animal body, foods and feeding, principles of breeding, breeding, feeding, and management of horses, cattle, sheep, and pigs, fattening of cattle, sheep, and pigs, dairying, poultry and poultry keeping, and harmful and beneficial animals.

Some suggestions regarding rural school agriculture, L. R. WALDRON (*Dakota Farmer, 32 (1912), No. 10, pp. 540, 541*).—The author suggests simple experiments in plant breeding, soils and soil physics, farm crops, plant diseases, germination of seeds, and a study of the weather, for use in public schools.

Corn, C. A. MCMURRY (*El. School Teacher, 12 (1912), No. 7, pp. 297–305*).—In this, the first of 3 papers which constitute the report of a committee of the Superintendents' and Principals' Association of Northern Illinois, the subject of corn is treated as a geography topic for the fifth or sixth grade. The paper presupposes lessons on corn in the earlier grades and suggests a historical consideration of the subject, the problem of corn production on a large scale in the corn belt, and a comprehensive survey of its importance in the world.

School exercises with corn, T. I. MAIRS (*Penn. State Col. Bul., 6 (1912), No. 2, pp. 20, figs. 7*).—This bulletin, which is intended for teachers rather than pupils, consists of 3 parts, suited, respectively, to the fall, winter, and spring and summer. The exercises embrace some that are suitable for all grades from the fifth or sixth to the upper classes of the high school.

Arbor Day manual ([*Boise*], *Idaho: Dept. Pub. Instr., 1912, pp. 24, figs. 2*).—The history of Arbor Day, directions for improving the school ground, including the preparation of a planting plan, selecting and obtaining trees and how to plant them, list of decorative trees and shrubs native to Idaho, and questions and answers for the instruction of pupils in the protection of forests are given.

Arbor Day annual, 1912, compiled by G. M. WILEY (*Albany, N. Y.: Ed. Dept., 1912, pp. 70, pls. 4, figs. 42*).—This annual is devoted to fruit trees in New York and includes the following articles: Arbor Day and Our Fruit Trees, by A. S. Draper; The Fruit Tree, by L. H. Bailey; Fruit Production in New York, by C. J. Huson; Orchard Management, by U. P. Hedrick; Cross Pollination of the Pear and Apple, by H. M. Dunlap; and The Care of Fruit Trees, by B. J. Case. These are followed by a short list of varieties of fruit for the home orchard and garden, and a suggested program and poems for Arbor Day.

Forest primers, D. E. BURCEZ, D. J. LAPIE, and G. LAPIE (*Cartilla Forestal. Mexico: Sec. Fomento, 1909, No. 1, pp. 35; 1910, No. 2, pp. 62; 1911, No. 3, pp. 57*).—These primers, which have been prepared by the professors of the schools for forest guards and revised and amplified by the central board of forestry, are résumés of the instruction given to students who wish to become forest guards. The first primer gives instruction concerning forest nurseries, the second on silviculture, and the third on reforestation.

A study of food, II, edited by MARY P. VAN ZILE (*Agr. Ed. [Kans. Agr. Col.], 3 (1910), No. 9, pp. 58, figs. 7*).—This concludes a previous article (E. S. R., 26, p. 493).

Some results of the farmers' cooperative demonstration work, B. KNAPP (*U. S. Dept. Agr. Yearbook 1911, pp. 285–296*).—This paper takes up in detail the purposes, scope, and success of the farmers' cooperative demonstration work in the Southern States.

MISCELLANEOUS.

Yearbook of the Department of Agriculture, 1911 (*U. S. Dept. Agr. Yearbook 1911, pp. 732, pls. 67, figs. 20*).—This contains the report of the Secretary on the work of the Department during the year; an account by B. T. Galloway of the life and work of the late Dr. S. A. Knapp (pp. 151–154); 30 special articles abstracted elsewhere in this issue; and an appendix containing an article by J. A. Arnold on the Publications of the United States Department of Agriculture and How They are Distributed; Review of Weather Conditions during the Year 1911, by P. C. Day; a directory of the Department, the agricultural colleges, the experiment stations, and state officials in charge of agriculture; and agricultural statistics, including summary tables from the agricultural returns of the thirteenth census as to number, area, and value of farms; value of farm buildings and live stock; farm expenses; mortgages; and nativity of families.

Twenty-fourth Annual Report of Alabama College Station, 1911 (*Alabama Col. Sta. Rpt. 1911, pp. 43*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1911, and reports of the director and heads of departments on the work of the station during the year. A portion of the report of the entomologist is abstructed on page 554 of this issue.

Twenty-second Annual Report of Arizona Station, 1911 (*Arizona Sta. Rpt. 1911, pp. 515–572, pl. 1, figs. 2*).—This contains the organization list, an administrative report by the director on the work and publications of the station, a financial statement for the fiscal year ended June 30, 1911, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue.

Twenty-fourth Annual Report of Vermont Station, 1911 (*Vermont Sta. Rpt. 1911, pp. XXXII+444+28, pls. 18, figs. 50*).—This contains the organization list, a brief announcement concerning the station, a financial statement for the fiscal year ended June 30, 1911, a report of the director on the publications and work of the station, and reprints of Bulletins 155 to 160, and Circulars 6 to 8, previously noted.

Index to publications of the Hawaii Agricultural Experiment Station, July 1, 1901, to December 31, 1911, A. T. LONGLEY (*Hawaii Sta. [Spec. Pub.], 1912, May 24, pp. 38*).

Monthly Bulletin of the Department Library, April, May, and June, 1912 (*U. S. Dept. Agr., Library Mo. Bul., 3 (1912), Nos. 4, pp. 113–142; 5, pp. 145–178; 6, pp. 181–206*).—These numbers contain data for April, May, and June, 1912, respectively, as to the accessions to the Library of this Department and the additions to the list of periodicals currently received.

Experiment Station Work, LXIX (*U. S. Dept. Agr., Farmers' Bul. 499, pp. 24, figs. 5*).—This number contains articles on the following subjects: Top-dressing pastures, making hay, a fresh-air brooder, roosting closet for poultry, exhibition contests for improving dairy products, blind staggers of horses, adobe as a building material, and white and color washes.

NOTES.

Iowa College and Station.—A recent decision of the state board of education relative to the coordination of the instruction in higher education makes radical changes in the scope of the existing state institutions. Under the new plan all work in engineering will be concentrated at the College of Agriculture and Mechanic Arts; the courses in professional education and the literary arts at the State Teachers College extending beyond the sophomore year will be discontinued and centered at the State University; and all courses in general science and domestic science at the College of Agriculture and Mechanics Arts will be discontinued and a school of household arts established at the State University. It is proposed to put the new plan into effect at the end of the present college year.

L. A. Maynard, assistant in chemistry, and H. C. Cosgriff, field superintendent, have resigned, and will be succeeded respectively by J. C. Reese and C. R. Forest.

Kansas Station.—Director E. H. Webster has resigned to become associate editor of *Hoard's Dairyman*, January 1, 1913.

Kentucky University and Station.—The establishment of a series of about 12 demonstration farms of about 20 acres each has been authorized, and arrangements whereby four of these farms, all located in the western part of the State, will be donated to the station have been practically completed.

Dr. J. H. Kastle has been appointed dean of the college of agriculture and director of the station. Frank T. McFarland, a 1912 graduate of the Ohio State University, has been appointed instructor in botany.

Louisiana Stations.—R. G. Fuller and Rene Baus have resigned as assistant chemists in the field and fertilizer laboratory.

Mississippi Station.—B. W. Anspon, assistant horticulturist, has become professor of floriculture and landscape gardening at the Maryland College.

Cornell University.—John W. Spencer, widely known as the organizer of the farmers' reading courses, the nature study courses for children, the junior naturalists' clubs, and the junior gardeners' clubs, died at Ithaca October 24, at the age of 69 years.

Pennsylvania College and Station.—Alva Agee has resigned as professor of agricultural extension and secretary of the school of agriculture to become, on December 1, head of the extension service of the New Jersey College and Stations. C. F. Shaw has resigned as assistant professor of agronomy and agronomist to become soil technologist in the University of California. John W. Gregg has resigned as assistant professor of horticulture and assistant horticulturist to become professor of landscape engineering in the University of California, beginning January 1, 1913.

Rhode Island Station.—Dr. H. J. Wheeler, whose resignation as director has been previously noted, has been appointed to the newly established position of agricultural-chemical expert of the American Agricultural Chemical Company, beginning December 1.

Virginia Truck Station.—F. E. Miller, a recent graduate of the University of Missouri, has accepted the position of assistant horticulturist. J. E. Pickett has been appointed horticultural foreman.

EXPERIMENT STATION RECORD.

VOL. XXVII. NOVEMBER, 1912. No. 7.

The 1912 convention of the Association of American Agricultural Colleges and Experiment Stations will long be remembered as one of the most interesting and inspiring annual gatherings of the association since its organization twenty-six years ago. Although the anniversary features stood out prominently, and there was a tracing of progress and a setting forth of what the establishment of these institutions has meant, the present-day problems did not lack for attention, and their consideration was characterized by a clearness of vision and a maturity of thought which showed the extent to which opinion has been crystallized on many fundamental lines of policy. A brief account of the convention will be given in a subsequent issue.

The three anniversaries observed this year commemorate the beginning of opportunity for agriculture in this country. Hence their special significance. It was in 1862, a half century ago, that the Morrill Act was passed donating public lands for industrial education, which marked the birth of the agricultural college in America; and it was in the same year that the National Department of Agriculture was founded at Washington. It was in 1887, a quarter century back, that the policy of federal aid for agricultural experimentation throughout the country was established. These three events are the most important from the standpoint of agriculture which this or any country has known. Out of them has grown the largest and most influential movement in education, the most highly developed department of agriculture, and the most comprehensive and efficient system of experiment stations to be found in any country.

Agriculture waited many centuries for such a recognition. It was a trade merely, conducted on the basis of experience and personal judgment, with only a hinted basis in science. It was unformulated as a teaching subject, the trade school being the only ideal in agricultural instruction, and there had been provided for it but slight means of acquiring knowledge except through empirical experience. For the most part it was guided by tradition, and it embraced an element of superstition, which ascribed important considerations to

the phases of the moon and the movement of other heavenly bodies. The idea that it involved much more than skill and intuition and brawn, or was teachable except as a practical art, or that experience and tradition could be extended and interpreted in the light of science, was new and restricted. It was only the farseeing who realized these possibilities. The farmers who had received a college education were not more successful than those who had not, for they found their education bore no relation to their business and they must go to school to the successful men of their neighborhood. Except for the broader vision it gave them, the influence of their education in advancing agriculture was negligible.

We have now become so accustomed to these three agencies for agricultural advancement, it would seem that their significance and great importance should always have been recognized. The struggle and opposition of a few years ago is lost sight of, and it is difficult to realize what an innovation their establishment marked. The review of the conditions under which these movements began, the history of their progress, and the measuring of their influence and position formed, therefore, matters of rare interest at the recent convention.

Such reviews were ably presented by Dr. W. O. Thompson for the land-grant colleges, Dr. A. C. True for the Federal Department of Agriculture, and Dr. H. C. White for the experiment stations. These papers, together with the presidential address of Dr. W. E. Stone and a paper by Dean Davenport on the American agricultural college, constituted the special anniversary features of the convention. By vote of the association these papers are to be printed separately from the proceedings for more extended distribution and use. Those relating to the land-grant colleges will here be considered, reserving for a future issue the anniversary of agricultural experimentation as embodied in the National Department of Agriculture and the American system of experiment stations.

In the presidential address of Dr. Stone and the historical paper of Dean Davenport, the history of these colleges was drawn upon to show something of the vicissitudes they have passed through, the dangers which still confront them, and the position they have attained in the field of education.

Dean Davenport characterized the history of the agricultural college as forty years of apparent failure and a dozen years of dazzling success. From the fact that the fundamental ideas underlying them were new and radical, they had to meet the conservatism of the older and well established institutions. In their early history they experienced an attitude of indifference, mistrust, and general lack of confidence. "Farmers did not believe in their principles. Edu-

cators regarded them as outside the sphere of educational recognition, and these attitudes were reflected by the general public." Further obstacles in the pioneer years were the undeveloped condition of science, the lack of a body of teachable knowledge, and the lack of trained teachers for industrial education. Even the experiment stations, which came after the barriers of prejudice had been partially broken down, were for a time received with scant confidence by either the public or by scientific men.

A large measure of credit was given the separate agricultural colleges for the success which has attended agricultural education in later years. These colleges for thirty or forty years withstood the brunt of the attack on this new education, worked out the ideals of the founders, and gradually developed the means and the system for teaching agriculture and secured recognition for it.

In the recent development of these institutions the constituency of the college has come to be the whole State, with provision for extension teaching and for agricultural research and demonstration. Their students have increased a thousand per cent in the last ten years, and at the same time the colleges have greatly advanced their standards. It was stated that in the case of the agricultural colleges connected with universities, fifty-five per cent of the graduates return to the land, and ninety-five per cent engage in some agricultural pursuit.

Now that the land-grant colleges have demonstrated their claim to an honorable place in the educational field, and have acquired prestige and public confidence, new opposition and jealousies have developed within the States as to the field they are occupying, the support to be given them, and other matters, giving rise to controversies which have threatened to disrupt them in some cases. This conflict between competing institutions Dr. Stone regarded as a matter of serious concern, calling for wise and liberal action. "In States where the land-grant college and state university are separated, no time should be lost by their authorities in arriving at an understanding as to the respective fields they are to occupy, always with reference to public welfare. Duplication of effort should be avoided for the sake of economy as well as harmony, and then good faith should be kept. The ideal adjustment between two such institutions is that which secures to the State, by coordination of both, the full range of instruction otherwise given in a single state university, without unnecessary duplication."

Failure to mutually agree upon an adjustment will inevitably bring legislative interference, and the possible clothing of a single board of regents with extraordinary power over the separate institutions. Particularly when the latter method is extended to interference with the internal administration, it was declared to be "destructive of the

spirit, the individuality, and the freedom so necessary to the life and progress of an educational institution."

Dr. Stone also referred to the attempts "to crystallize an interpretation of the Morrill Act to the effect that the land-grant colleges were intended to be of secondary grade—a kind of industrial and trade school; that agricultural instruction is *per se* of this order, and that 'mechanic arts' means trade and vocational training rather than engineering," an assumption which he found to be borne out by neither the law nor the facts.

"All of these difficulties, the struggle for recognition, the opposition of competing institutions, the attempts to segregate the colleges in an inferior class, were but to be expected under the circumstances. They constitute real obstacles and hindrances to progress in many cases. They might have been to a larger degree averted by concerted and positive action of the institutions in formulating their policies with regard to those things and defining their positions in advance."

Dr. Stone also discussed the situation growing out of the present extraordinary general interest in agriculture, which has brought demands on the college the result of which "is likely to be a weakening and letting down of the quality of its instruction and research." Although recognizing this popular awakening as one of the most encouraging movements of the day, he held that extension work demands the wisest guidance in order that it may find its right place and relation in the organization of our institutions. While promoting it and giving it true direction, "we should guard jealously our scientific workers and teachers from the distractions of extension enterprises. It is most certain that the future will demand more and more of our institutions; that much of the present extension work will prove only ephemeral; that the demand will be for more thorough teaching, serious investigations, and for a service which eventually can only be supplied by those who labor in the laboratory and class room rather than on the lecture platform. To prepare for this time we must increase rather than diminish the substantial scientific work in our stations and sound teaching in our colleges, as the reserve from which extension activities must always draw their inspiration and material."

Viewing broadly the work of these land-grant institutions, Dr. Stone declared that their establishment "has brought the application of scientific principles into the commonest occupations, emphasized the democracy of education, established the status of tax-supported institutions of higher learning, and, more than any other cause, contributed to the development of the new education. Now, at the end of fifty years, the land-grant colleges with the experiment stations and

the departments of agricultural extension constitute the most unique, useful, appreciated, and popular group of institutions in the country."

The influence of the Morrill Act upon American higher education, as presented by Dr. W. O. Thompson, was especially interesting because of the review it gave of the early efforts to secure federal aid for industrial education, the ideals developed by these institutions, and the scholarly deductions drawn as to the wider influences these colleges have had on education.

At the present time when these institutions have so abundantly justified themselves and the wisdom of their establishment, it is difficult to realize that the Morrill bill should have been opposed and vetoed on such grounds as its supposed effect on the relation of the federal and state governments, the effect on existing institutions, doubt as to whether it would promote the advancement of agriculture, and the contention that Congress could not appropriate money for education in the States and hence its aid by means of land grant was of doubtful constitutionality. A characteristic feature of the debate of that time, as Dr. Thompson pointed out, was the inconsistency of the position that public land could with propriety be donated for certain types of education (as had already been done in numerous instances), but the doubt as to the propriety of extending this aid to establishing institutions for agricultural education. The land-grant colleges have set at rest this doubt and proved the wisdom of federal aid to education.

As to the origin of the agitation for industrial education and the support it received, Dr. Thompson developed the interesting fact that "in the great agricultural States this movement was born and cherished among the progressive and prosperous farmers in the several communities." He showed this by many references to the reports of agricultural societies and meetings the country over. There was a widespread movement for a practical type of education which should relate more directly to the everyday life of the common people. "This new educational reform sprang not from the educational philosophers or the professional teachers, but from the rank and file of the people themselves." And having developed out of this desire, the land-grant colleges have taken it as their ideal "to teach all knowledge to all men."

This marks a sharp contrast between them and the class of institutions which aim to teach the essentials to prepared men. The needs of the people have been the guiding spirits for the land-grant institutions. The maintenance of conventional standards is not the central idea, but the liberal education of the industrial classes. Such a public-supported institution is to be operated "for the good it can

do, for the people it can serve, for the science it can promote, and for the civilization it can advance," a view of democracy in education which is now reflected in many other classes of institutions.

Furthermore, as Dr. Thompson pointed out, the colleges of agriculture and mechanic arts have constituted a great national movement for science in higher education. Their attitude toward science is one of the significant products of the Morrill Act. When science was struggling for recognition in the school programs of the country the land-grant institutions recognized that from the very terms of the law they were to teach the sciences related to agriculture and mechanic arts. While they have emphasized the economic phases of science, obviously applied science must follow pure science, and this has tended to broaden the scope of their field and teachings.

One effect of these colleges on the state universities with which they were associated was that the latter were "forced into a freedom hitherto unknown in higher education. This attitude toward science steadily influenced the attitude toward every other subject properly within the horizon of the university." As a result the state university "found itself free to teach in every field of human inquiry and to investigate any subject yielding knowledge."

The influence of the land-grant colleges upon higher education, viewed from their history of fifty years, and the real positions which these institutions have occupied in the educational world, was summed up by Dr. Thompson under the following heads:

(1) The land-grant colleges have clearly stimulated the interest of the people in higher education. "Apart from the education provided for the students, they have demonstrated their capacity for public service and have carried to the people an uplifting message."

(2) They have set a precedent for federal aid to education and proved the wisdom of it—of using a portion of the government's increasing revenues "for the purpose of developing a people able to sustain an efficient government."

(3) Thy have brought industrial education to its rightful place in the esteem of the American people, and have forced its recognition by all institutions for higher education.

(4) They have efficiently influenced the practical aims of higher education by insisting upon a larger liberty in the programs of education and in the contents of the course of study.

(5) They have stimulated investigation and research in many fields. "We can not be blind to the fact that very much of the investigational and research work of American higher education to-day finds inspiration in the achievements of these institutions."

(6) They have had an influence on the Government itself which has affected the cause of higher education. "The fact that government has become more humane, more beneficent, and almost philan-

thropic in many of its activities, is probably due to the humanizing influence of the educational activities supported and stimulated by the Government."

It is refreshing to have a liberal-minded, appreciative estimate of these institutions, based on an intelligent and intimate study of their activities and influence. It is inspiring, because it shows how large a factor they have actually been in the evolution of industrial education. The other side has often been presented, and, as if misrepresentation had become a habit, credit continues to be denied them, even when they have attained a high degree of success and the results are so much in evidence.

One critic who views the function of the agricultural colleges as that of training farmers, and hence argues for the trade school standard, has recently, in connection with a discussion of the proposed reorganization of a state institution, presented an elaborate argument in favor of an agricultural school pure and simple, maintaining that agricultural education can not be properly developed when associated with engineering. Again, a document has quite recently been issued giving the distribution of college and university graduates among the professions and various walks of life, including agriculture. This survey evidently takes a similar view of the scope of agriculture, for we read in the deductions from the analysis that "in spite of the comparatively large number of agricultural courses, farming does not attract and never has attracted a very large number of college graduates." It may be mentioned in passing that the list of institutions studied includes only three of the state universities of the central west having courses in agriculture, and not a single separate college of agriculture and mechanic arts. The largest quota of graduates entering farming from the colleges included in the analysis is reported as less than four per cent, in the years 1836 to 1840, a time when there were, of course, no agricultural courses in any American colleges. After this the deduction follows (from data ten years old or more for fully half the institutions) that "although the number of graduates entering agricultural pursuits is increasing, it is not increasing so rapidly as the number entering other professions. Consequently the curve for the college-bred farmer is falling."

It is hoped that some time we may have reliable statistics on the graduates of land-grant colleges, made on a basis which will show not only how many are going into farming as a business, but how many are entering the broader field which the agricultural colleges represent. Until we have this and a recognized distinction between the duty of these institutions toward farming as a trade, and toward the immeasurably broader field of agriculture as a great fundamental

industry, a condition under which a large share of the people live, a subject with its professional as well as its trade aspects,—until then the success of these colleges will continue to be measured by conflicting standards, often inadequate and unfair.

As President Stone well said: "One must know their history to appreciate their vigor and strength; must come in touch with the quality and character of their work; must grasp their scope and their relation to the life of the people, in order to comprehend their place in the educational world."

Fifty years is a short time as the world reckons time. It is a short time in which to bring about a new attitude toward education, to develop pedagogic methods suited to the needs of a new department of it, and to exert so vital an influence on higher education in general. It is a short time to lay the foundation for a science of agriculture, and supplant the rule of thumb by the rule of reason.

To-day nearly everyone recognizes the power and might of science, and nearly everyone pays it at least outward homage. The common laborer on the farm believes in its possibilities, just as does the manufacturer, the man of large business interests, and the housekeeper.

But this is a distinctly modern attitude. Only a half century ago the foundation of one of the institutions benefiting by the land-grant act was attacked on the ground that science is antagonistic to humanity. The contention was that science was unsuited to be an instrument of education because it dealt with nature rather than with man. To-day such a view would find scant support. Science is seen to be intensely human, and science in the service of man has become a watchword of progress. Half a century has demonstrated to the world something of the magnitude of its power to make for human betterment; and the most convincing and widely heralded illustrations of this have come through agriculture.

It is safe to say that no single factor has had a greater influence in bringing about this change in attitude than the agricultural investigation at these institutions, and their remarkable activity and success in popularizing science.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Technical methods of chemical analysis, edited by G. LUNGE ET AL., trans. and edited by C. A. KEANE ET AL. (*London, 1911, vol. 2, pts. 1, pp. XXVII+610; 2, pp. XII+611–1252, figs. 149*).—Among the subjects taken up in these parts of this work (E. S. R., 21, p. 105) are artificial manures, feeding stuffs, ammonia, and synthetic and naturally occurring organic dyes.

Solubility determinations in agricultural chemistry, A. RINDELL (*Akad. Einladungsschr. Helsingfors, 1910, pp. 67; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 2, p. 84*).—This is a general discussion of solubility, its importance in agricultural chemistry, and the methods of determining solubility.

In experiments with Thomas slag it was found that the phosphoric acid was present apparently in a very insoluble form. "Experiments with pure water after 55 days' stirring at 25° C., using 10 gm. of substance per 1,000 gm. of water, show that with Thomas meal 0.1790 gm. of calcium oxid and 0.0316 gm. of phosphoric acid dissolve, whereas from raw phosphates the solution only takes up from 0.00075 to 0.0025 gm. of phosphoric acid, except in the case of Mexico phosphate, which is more soluble than Thomas meal. These phosphates will be perhaps slightly more soluble in soil solutions, but water is far preferable as a solvent in such cases to the 2 per cent citric acid usually employed, in which the soil constituents have too great a solubility. Stress is laid on the difficulties of finding solubility methods applicable to agricultural problems to which no theoretical objections can be raised, and the importance of introducing physical chemical methods into these conceptions is emphasized."

A modification of the diphenylamin test for nitrous and nitric acids, W. A. WITHERS and B. J. RAY (*Jour. Amer. Chem. Soc., 33 (1911), No. 5, pp. 708–711*).—This material has been noted from another source (E. S. R., 25, p. 804).

Determination of lithium, W. W. SKINNER and W. D. COLLINS (*U. S. Dept. Agr., Bur. Chem. Bul. 153, pp. 38*).—After a comprehensive review of existing methods for lithium, particularly in mineral waters, a modification of the Gooch method which has been developed and used in the Bureau of Chemistry is described. This method was found to be entirely satisfactory where weighable amounts of lithium were present.

Pyridin as a solvent for the lithium salts was found to be objectionable on account of its unpleasant odor, the difficulty of preparing and keeping it sufficiently free from water, and the fact that in water analysis usually very small quantities of lithium chlorid are to be separated from large quantities of sodium and potassium chlorid.

For the spectroscopic estimation of lithium the methods of Ballman, Bell, or Foehr, when modified to employ the alkalis as extracted by amyl alcohol, were found satisfactory. The quantitative spectroscopic method, however, is not deemed preferable to the Gooch method where weighable amounts of lithium are present.

A method of estimating calcium carbonate in soils, H. S. SHREWSBURY (*Pharm. Jour.* [*London*], *4. ser., 34 (1912), No. 2527, p. 394*).—The method is as follows:

"Ten gm. of finely divided air-dried soil is treated with 100 cc. of roughly quarter-normal acetic acid, rotating the flask every time most of the soil settles, during 10 minutes. The same weight of soil is treated in the same manner with 100 cc. of distilled water. Twenty-five cc. of the filtrate from each extraction is evaporated in a platinum dish, ignited at a bright red heat for 30 minutes, and the residues of (principally) lime dissolved in 10 cc. or more if necessary of decinormal acetic acid. Titrating back with decinormal soda or potash and phenolphthalein gives the cubic centimeters equivalent to the lime in the residues. Subtracting the volume obtained from the control (which will not exceed 0.1 cc. in most soils), the remainder multiplied by 0.2 gives the percentage of calcium carbonate in the soil. The control experiment eliminates such bodies as the carbonates or organic salts of the alkalis, soluble organic calcium salts, calcium nitrate, etc. Acetic acid is chosen for the titration as it does not dissolve ignited iron oxid."

The results of tests with 4 soils are also included.

The estimation of ammonia in carbonated waters, G. D. ELSDON and N. EVERS (*Pharm. Jour.* [*London*], *4. ser., 34 (1912), No. 2527, pp. 394, 395*).—The presence of carbon dioxid in water seriously interferes with the determination of ammonia in such waters by the Nessler method. The following method will overcome much of the difficulty:

After shaking the flask containing the water by the usual method, 500 cc. is transferred to a distilling flask and 5 cc. or more of normal sulphuric acid, according to the alkalinity of the water, is added. An equivalent amount of normal sodium hydrate and a sufficient amount of sodium carbonate are then added and the usual procedure for determining free and albuminoid ammonia followed.

Nitric nitrogen in mixed fertilizers, S. S. PECK (*Jour. Indus. and Engin. Chem., 3 (1911), No. 11, pp. 817, 818*).—The reliability of the modified Gunning and Kjeldahl methods for determining total nitrogen in a mixture containing an addition of nitrate of soda was studied.

The author believes on the basis of his findings with a new procedure, which is given below, that good results can be obtained with the Gunning method providing the moisture content of the sample is not too high. There was no loss of nitrogen noted in a mixed fertilizer containing sodium nitrate and sodium phosphate, which was kept for a period of 4 months. The method used is as follows:

Ten gm. of the fertilizer was transferred to a beaker and stirred with some water for about 1 hour. The mixture was then filtered, and the residue washed until a total bulk of 500 cc. of filtrate was obtained. Twenty-five cc. of the filtrate was then distilled with sodium hydrate for ammonia nitrogen. 25 cc. more reduced with iron and sulphuric acid for determining the nitric nitrogen, and a further 25 cc. used for determining the total nitrogen by the Kjeldahl method (using a 500 cc. flask with mercury, sulphuric acid, and potassium sulphate).

The nitrogen in the residue which remained on the filter paper was also determined but it was necessary first to render it air dry.

Report of the committee on phosphate rock, W. D. RICHARDSON ET AL. (*Jour. Indus. and Engin. Chem., 3 (1911), No. 10, pp. 783–787*).—This is a report of the committee appointed by the division of fertilizer chemistry of the American Chemical Society on the analysis of phosphate rock. It includes the reports

of 3 subcommittees, on water, phosphoric acid, and iron and aluminum, and the work of 20 analysts.

The forms of phosphorus in cotton-seed meal, J. B. RATHER (*Texas Sta. Bul. 146, pp. 3–16*).—The preliminary portion of this work shows that fat in cotton-seed meal does not interfere with the extraction of the phosphorus compounds and their determination by the official volumetric method. Meal washed with ether yielded 0.213 per cent of phosphorus soluble in 0.2 per cent hydrochloric acid; unwashed meal 0.235 per cent. The lower results obtained when washing are thought possibly to be due to the extraction of lecithin.

Other tests showed that the phosphorus extracted by 0.2 per cent hydrochloric acid was much lower than the published results for water-soluble phosphorus. The phosphorus not extracted from meal by 0.2 per cent hydrochloric acid could not be precipitated by acidifying the alkaline (ammonia) extract with hydrochloric acid. The method of Forbes et al. (E. S. R., 23, p. 303) was not found to include any appreciable amounts of meta- and pyrophosphoric acids in the determinations of inorganic phosphorus.

"The phosphorus soluble in 0.2 per cent hydrochloric acid was about 25 per cent of the total phosphorus. The inorganic phosphorus (Forbes method), in the samples of cotton-seed meal examined was less than 5 per cent of the total phosphorus. The phosphorus in the hydrochloric acid extract of cotton-seed meal capable of being precipitated by magnesia mixture and not soluble in acid alcohol was about 16 per cent of the total phosphorus. After extraction with 0.2 per cent of hydrochloric acid the phosphorus remaining was insoluble in water but nearly completely soluble in 0.2 per cent ammonia. Magnesia mixture precipitated most of the phosphorus extracted by ammonia. Practically all of the phosphorus was precipitated from the aqueous extract of cotton-seed meal by lead subacetate and by copper acetate. The principal compounds containing phosphorus were separated, which give the same reaction as those relied upon for proving the presence of meta- and pyrophosphoric acid. We have no evidence that the samples of cotton-seed meal examined contain either pyrophosphoric acid or metaphosphoric acid."

See also a previous note by Crawford (E. S. R., 23, p. 8).

Lutein obtained from egg yolks, R. WILLSTÄTTER and H. H. ESCHER (*Hoppe-Seyler's Ztschr. Physiol. Chem., 76 (1912), No. 2–3, pp. 214–225, pl. 1; abs. in Chem. Abs., 6 (1912), No. 6, p. 761*).—The coagulum obtained by treating with alcohol yolks from 6,000 eggs, which weighed 110 kg., when extracted with acetone gave an extract containing lutein. The cholesterol and lecithin were precipitated from the acetone solution with petroleum ether, and 4 gm. of crude lutein was obtained by crystallizing from the concentrated petroleum-ether solution. With the exception of the melting point, which was between 192 and 193° C., the substance simulated xanthophyll. It differed from carotin in that it was more soluble in ethyl and methyl alcohol.

Soy-bean oil, H. MATTHES and A. DAHLE (*Arch. Pharm., 249 (1911), No. 6, pp. 424–435; abs. in Jour. Soc. Chem. Indus., 30 (1911), No. 18, p. 1124*).—"Soy-bean oil contains 94 to 95 per cent of fatty acids (present as glycerol esters), of which about 15 per cent consist of saturated acids (palmitic acid) and about 80 per cent of liquid unsaturated fatty acids. The latter were found to consist of about 70 per cent of oleic acid, about 24 per cent of linolic acid, and about 6 per cent of linolenic acid. Samples of the oils labeled 'purified' and 'unpurified' had the following characters, respectively: Specific gravity at 15° C., 0.9260, 0.9265; solidifying point, —11.5° C., —12° C.; refractive index at 40° C., 1.4680, 1.4680; acid value, 5.7, 1.71; saponification value, 192.3, 194.3; iodin value (Hübl, after 18 hours' action), 131.3, 132.6; Reichert-Meissi value, 0.75, 0.75;

Polenske value, 0.78, 1.08; elaïdin reaction, positive. Exposure of the oil for 6 months (in daylight) to moist air increased the acid value but lowered the iodin value. Pure oxygen both in the absence and presence of moisture had no influence on the iodin value."

Valuation of tea, A. A. BESSON (*Chem. Ztg., 35 (1911), Nos. 88, pp. 813–815; 90, pp. 830–832; abs. in Analyst, 36 (1911), No. 426, p. 454*).—These are the results of examining about 90 samples of tea, 43 of which were Chinese tea, while the remainder were from Ceylon, Java, and India. In the investigation particular stress was placed upon the stem or stalk content of the samples, but the work shows that very little relation exists between the amount of stalk and the price and quality of the tea as determined by the tasting test. It was noted, however, that Java tea which is grown at an altitude of 4,500 ft. was much better in quality than that grown at an altitude of 1,800 ft.

Analyses of 90 samples of tea.

Kind of tea.	Moisture.	Stalk.	Ash.	Caffein.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Chinese green tea	6.00–7.69	0.4–5.3	4.88–7.46	2.13–3.22
Chinese Foochow	6.29–9.06	4.1–17.5	4.80–5.73	2.23–3.64
Chinese Hankow	6.48–8.33	8.6–17.1	4.95–5.65	2.65–3.64
Ceylon tea	4.57–8.12	5.8–43.4	4.54–5.65	2.80–4.10
Indian tea	4.00–8.08	11.5–37.4	4.72–5.64	3.31–4.15
Java tea	8.22–10.50	4.4–29.9	5.53–7.32	2.22–4.54

Researches on the nature of enzym action.—II, The synthetic properties of antiemulsin, W. M. BAYLISS (*Jour. Physiol., 43 (1912), No. 6, pp. 455–466*).—"The intraperitoneal injection of emulsin does not give rise to the production of any true antienzym, although precipitins for the proteins contained in the solution are produced. The inhibitory action of such immune serum on the action of emulsin in vitro is no greater than that of normal serum, as was also found by Coca, and is merely due to diminution of the optimal acidity. Neither normal nor immune serum is capable of synthetic action. Emulsin, on the other hand, will synthesize lactose and also the glucosid of glycerol. This synthesis by the enzym is retarded by the presence of serum, presumably owing to diminution of acid reaction. Incidentally it is shown that emulsin is not of protein nature."

The determination of crude fiber in finely powdered materials, W. GREIFENHAGEN (*Ztschr. Untersuch. Nahr. u. Genussmtl., 23 (1912), No. 3, pp. 101, 102*).—The determination of crude fiber in materials like powdered cotton seed, cocoa, etc., by the König method presents several difficulties, notably as to the time required for the filtration process. The author recommends the use of a Buchner nutsche apparatus, 10.5 cm. in diameter, which contains a thin layer of asbestos fiber to serve as a filter, or, if a nutsche is not obtainable, a perforated porcelain plate may be substituted in filtering the undiluted hot fluid. The residue can be washed on the filter without any trouble. The author was able in a period of 2 hours to make 8 crude fiber determinations.

In regard to the determination of lecithin, P. SALZMAN (*Apoth. Ztg., 26 (1911), No. 91, p. 949; abs. in Chem. Ztg., 36 (1912), No. 9, Repert., p. 37*).—Glikin's method (E. S. R., 22, p. 410) was found to give the best results.

The flocculation of lecithin and lecithin protein mixtures with acids, J. FEINSCHMIDT (*Biochem. Ztschr., 38 (1912), No. 3–4, pp. 244–251*).—Aqueous suspensions of lecithin preparations possess optimum flocculation points in a definite hydrogen ion concentration. This concentration is a very strong acid

one and lies between 10^{-2} and 10^{-4}, and depends upon the lecithin preparation under examination. Neutral salts were found to cause an even greater turbidity of the suspension, but had the disadvantage of inhibiting the flocculating process and changing the optimum.

By mixing lecithin and protein together a new complex is produced which at first flocculates very markedly but later causes only turbidity in the optimum points for pure lecithin. This, according to the author, is the first time in which it has been shown that a colloid, sensitive to an acid, may be influenced by the addition of another colloid.

Estimation of minute amounts of arsenic in foods, E. CLARK and A. G. WOODMAN (*U. S. Dept. Agr., Bur. Chem. Circ. 99, pp. 7, figs. 3*).—A modification of the Marsh-Berzelius method as applied to the estimation of minute amounts of arsenic in foods is described. The method makes use of the form of apparatus devised by Bishop for the determination of arsenic in sulphuric acid.[a] In the method standard mirrors are prepared for comparison. Antimony, when present in the material under examination, must be removed before testing.

Honey and its analysis, F. MUTTELET (*Ann. Falsif., 4 (1911), No. 30, pp. 192–196*).—This is a bibliography of the literature in regard to the chemistry of honey. See also a previous note (E. S. R., 25, p. 109).

Examination of marmalades and milk chocolates, HÄRTEL (*Chem. Ztg., 34 (1910), No. 141, p. 1256; abs. in Chem. Abs., 6 (1912), No. 6, p. 781*).—"The author prefers to filter off the insoluble matter, wash, dilute the filtrate to a definite volume, and analyze aliquot parts of this. For milk chocolate, the Baier and Neumann method is recommended, also the determination of the Reichert-Meissl number, which with a 10 per cent milk addition is 2.8 to 3, with 20 per cent 5.6 to 6."

Cider vinegar, F. E. MOTT (*Jour. Indus. and Engin. Chem., 3 (1911), No. 10, pp. 747–750*).—This is a description of a method which has for its purpose the detection of certain forms of adulteration in cider vinegar which are being practiced at the present time. It depends upon the relation of levulose and dextrose in pure cider vinegar as calculated from the percentage of reducing sugars present, expressed as dextrose, and the polariscope reading in degrees Ventzke as observed in the 200 mm. tube.

The detection of benzoic acid in coffee extract, H. C. LYTHGOE and C. E. MARSH (*Jour. Indus. and Engin. Chem., 3 (1911), No. 11, p. 842*).—"Make the solution acid and extract several times with ether. Wash the combined ether extracts with water and extract with ammonia. Evaporate the ammoniacal extract to a small volume, adding ammonia from time to time to prevent it from becoming acid, and add a solution of manganese sulphate. Filter through a small filter, wash with as little water as possible, and add ferric chlorid to the filtrate, when a dark greenish precipitate will occur if benzoic acid is present. Evaporate to dryness in the casserole in which the precipitation was made, and sublime by placing an inverted funnel covered with a filter paper in the dish and heating over an asbestos gauze. Remove the funnel and determine the melting point of some of the crystals which, if benzoic acid, should be 121.4° C. The rest of the crystals may be dissolved in ammonia, the excess of ammonia evaporated and ferric chlorid added, when the characteristic flesh-colored precipitate will occur if benzoic acid is present.

"For quantitative purposes the method of Edmund Clark[b] was employed with good results, as the natural reacting substance has but little influence."

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[a] Jour. Amer. Chem. Soc., 28 (1906), No. 2, pp. 178–182.

[b] Science, n. ser., 30 (1909), No. 764, pp. 253, 254.

Spirit of nitrous ether. H. H. HANSON and A. K. BURKE (*Maine Sta. Bul. 201, pp. 147–158, fig. 1*).—The factors bringing about the deterioration and decomposition of spirit of nitrous ether, commonly called sweet spirits of niter, were studied. A sample of the product kept in strict accordance with the directions given by the United States Pharmacopœia maintained constant strength for 60 days and decreased only slightly the next 30 days. Under less favorable conditions decomposition began at once and steadily continued.

When determining the amount of ethyl nitrite in spirit of nitrous ether by liberating the nitrogen dioxid and measuring the gas in the nitrometer, the volume did not become constant in from 30 to 60 minutes' time as one would be led to suppose by the directions given in the Pharmacopœia, but was found to increase slowly and at a varying rate, and was influenced by various factors. It is not deemed practicable to attempt to obtain an absolutely constant volume nor to apply a factor as a correction for the last traces of gas. A modified method of analysis, for which better results are claimed than with either the old or new Pharmacopœia methods, is described. The modified method is considered more economical in time and reagents, and can be more easily manipulated.

Use of saponin for homogenizing samples of milk to be examined, A. FROUIN (*Ann. Chim. Analyt., 16 (1911), No. 12, pp. 454, 455; abs. in Chem. Abs., 6 (1912), No. 6, p. 781*).—It often happens that milk samples destined for examination after standing for several months can not be properly homogenized by shaking, etc. If bile is added to such milk a uniform suspension can be obtained, but the mixture putrifies very easily. When saponin is added to milk previously neutralized to litmus with ammonium hydroxid in amounts of 0.005 gm. to 100 cc. of milk, and the mixture is heated from 40 to 56° for 10 minutes amid frequent shaking, a well homogenized mixture is obtained which will not interfere with the analytical results.

A new method for determining fat and salt in butter, especially adapted for use in creameries, R. H. SHAW (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 202, pp. 8, fig. 1*).—The procedure consists of melting the butter at 100° F., mixing it thoroughly with a spatula or spoon and weighing off 20 gm. in a small beaker, transferring the melted butter to a special form of separating funnel of known weight with the aid of water, centrifuging in a Babcock centrifuge about 1 minute, drawing off the water containing the salt and then dissolving the curd with dilute sulphuric acid (9 cc. of cold water and 11 cc. of sulphuric acid). After centrifuging again for 1 minute the acid solution containing the curd is drawn off and the separatory funnel containing the fat is weighed. The separatory funnel and the special form of socket for holding it in the centrifuge are illustrated. Results obtained in the test compared reasonably well with those given by the official method.

The washings from the above test are used for determining the salt content, by estimating chlorin with a volumetric solution of nitrate of silver (14.525 gm. per liter), using a 10 per cent potassium chromate solution as the indicator. If the moisture content of the sample is known the percentage of curd can be found by difference.

The index of refraction of the mixed acids of fatty oils, W. B. SMITH (*Jour. Indus. and Engin. Chem., 4 (1912), No. 1, pp. 36–38; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 3, p. 139; Science, n. ser., 35 (1912), No. 897, p. 381*).—"The relation between the refraction of the oil and the refraction of the acids depends upon the percentage of acid in the glycerids, being nearly independent of the total refraction and of the iodin value."

The ratios between the refraction of oils and their insoluble acids were determined. For linseed, cod-liver, soy-bean, corn, rape-seed, cotton-seed, pea-

nut, and olive oils, the figure fluctuated between 0.9933 and 0.9947, while for oleo oil, lard, lard stearin, oleostearin, cacao butter, palm-nut oil, butter (renovated), coconut oil, and a mixture of cotton-seed oil and oleostearin it was between 0.9923 and 0.9941.

The above figures are in accord with those which can be calculated from published refractive indexes and with the ratio of the refraction of fatty acids and triglycerids. The saturation of the acid has little effect upon the ratio, which is 0.9938 for stearin, olein, linolin, and linolenin, and with the lower acids a decrease, as with palmitin 0.9922 and laurin 0.9905.

Some typographical errors in reference books are pointed out, particularly in regard to the refractive index usually published for the insoluble acids of olive and rape oils and cacao butter. Olive oil is said to be low by about 0.005.

Coconut fat with a high iodin number, W. VAUBEL (*Ztschr., Öffentl. Chem., 18 (1912), No. 3, pp. 46, 47*).—The findings were practically the same as those of Richardson, previously noted (E. S. R., 26, p. 611).

Abnormal beeswax, G. BUCHNER (*Ztschr. Öffentl. Chem., 18 (1912), No. 5, pp. 90, 91*).—A discussion of the analytical results obtained with beeswax of known (East African, Italian, and Spanish) and unknown origin. In most cases it was noted that where the free acidity was normal or slightly higher there was a diminution in the ester figure and an increase in the hydrocarbon content.

In regard to the separation of organic phosphorus compounds of feedstuffs, G. FINGERLING and A. HECKING (*Biochem. Ztschr., 37 (1911), No. 5–6, pp. 452–456*).—Stutzer's method (E. S. R., 20, p. 173) utilizes nitric acid for dissolving the precipitate obtained with calcium chlorid and ammonium hydroxid and reprecipitates with molybdate. According to the results of this work the method can be employed only for the separation of inorganic phosphorus from lecithin, casein, nuclein, and sodium nucleate, and not when phytin is present.

With appropriate modifications in the method it may be possible to extend its use to the examination of plant materials containing phytin.

The determination of moisture content of beet seeds, H. PLAHN (*Centbl. Zuckerindus., 19 (1911), No. 46, pp. 1549, 1550, fig. 1; abs. in Chem. Abs., 6 (1912), No. 6, p. 812, fig. 1*).—The usual method utilized for this purpose consists of drying 5 gm. of the seed balls for at least 14 hours to constant weight. This, however, does not include colloid water. If these samples are weighed directly in the oven, illustrated in the original article, the time of drying can be reduced to from 5 to 6 hours.

"Experimental work showed that the time could not be shortened by subdividing the sample and heating higher, for some of the 'colloid water' was driven off. The decrease in weight of 5 gm. after 60 minutes was in proportion to the amount of water in the sample. A table was constructed, as the average of a large number of determinations, showing the decrease in weight after 30 minutes and 60 minutes and the respective percentages of water. The moisture content should be taken when constant weighings are first observed, generally after 110 to 125 minutes, according to moisture content."

A chemical-technical vade mecum for sugar refineries, A. GRÖGER (*Chemisch-Technisches Vademekum für Zuckerfabriken. Prerau, vols. 1, 1901, pp. XVI+573; 2, 1906, pp. XV+344; Brünn, vol. 3, 1911, pp. XII+697*).—This is a digest of the literature pertaining to the chemo-technology of the sugar industry. The literature from 1851 to 1910 is considered.

The carbohydrate constituents of Para rubber; separation of l-methyl-inositol, S. S. PICKLES and B. W. WHITFEILD (*Proc. Chem. Soc. London, 27 (1911), No. 383, p. 54; Bul. Imp. Inst. [So. Kensington], 10 (1912), No. 1, pp. 25–27*).—A sample of Para rubber was found to have a very high percentage of

acetone-soluble substances, which are usually reported collectively as resin. On making a close examination of the so-called resinous substances it was found that 2.7 per cent of them consisted of a carbohydrate which was identified as l-methylinosit.

In regard to helianthus tubers for alcohol production, J. von Héricz-Tóth and A. von Osztrovszky (*Kisérlet. Közlem., 14 (1911), No. 4, pp. 589–594*).—From the results obtained by analysis and laboratory fermentation tests with helianthus tubers (*Helianthus doronicoides*), it seems that this is a good source of raw material for producing alcohol. The refuse also contains a high fat and protein content, and is considered more nutritious than potato slops obtained from distilleries for feeding stock.

Annual reports of the progress of chemistry for 1911, edited by J. C. Cain and A. J. Greenaway (*Ann. Rpts. Prog. Chem. [London], 8 (1911), pp. IX+319*).—This publication deals with the progress made in general, physical, inorganic, organic, analytical, physiological, agricultural, and mineralogical chemistry, vegetable physiology, and radioactivity during the year 1911.

Proceedings of the twenty-eighth annual convention of the Association of Official Agricultural Chemists, edited by H. W. Wiley and Anne L. Pierce (*U. S. Dept. Agr., Bur. Chem. Bul. 152, pp. 268, figs. 4*).—This is the official report of the proceedings of the convention held at Washington, D. C., Nov. 20 to 22, 1911, a summarized account of which has been previously noted (E. S. R., 26, p. 97).

METEOROLOGY—WATER.

Monthly Weather Review (*Mo. Weather Rev., 40 (1912), Nos. 5, pp. 659–813, pls. 10, fig. 1; 6, pp. 815–976, pls. 9, figs. 6*).—In addition to the usual climatological summaries, weather forecasts and warnings for May and June, 1912, notes on the application of upper-air observations to weather forecasting for May and June, 1912; river and flood observations, lists of additions to the Weather Bureau library and of recent papers on meteorology, a condensed climatological summary, and climatological tables and charts, these numbers contain the following special papers:

No. 5.—May, 1912, Flood in Michigan, by F. H. Coleman; The Effect of the Time of Observation on Mean Temperatures, by C. A. Donnel; The Annual Rainfall and Temperature of the United States, by G. A. Lindsay; Unusual Hailstorm, Wichita, Kans., by R. H. Sullivan; Snow Survey on Pole Creek Watershed, Sanpete County, Utah, by B. F. Eliason; Notes on the Rivers of the Sacramento and Lower San Joaquin Watersheds during May, 1912, by N. R. Taylor; Notes on the Streams of the Upper San Joaquin Watershed, by W. E. Bonnett; and Studies in Frost Protection, Effect of Mixing the Air (illus.), by A. G. McAdie.

No. 6.—Special Notes on the Weather in Florida during June, 1912, by A. J. Mitchell; Severe Storms of June 16, 1912, by J. M. Kirk; Drainage of American Bottoms, by C. J. Root; Tornado in Southwest Missouri, June 15, 1912, by G. Reeder; Electric Storms in Western Kansas, by S. D. Flora; Flood in the Colorado, by F. H. Brandenburg; Snow Slides and Slips (illus.), by L. Peugeot; Some Effects of Surface Slope on Climate, by J. C. Alter; Notes on the Rivers of the Sacramento and Lower San Joaquin Watersheds during June, 1912, by N. R. Taylor; Notes on the Streams of the Upper San Joaquin Watershed, by W. E. Bonnett; Weather at Point Reyes Light, Cal., during June, 1912, by J. Jones; Preserving Mamme Caprifigs from Frost, by G. P. Rixford; Heating the Atmosphere, by A. G. McAdie; Convenient Conversion Table for Frost Work, by A. G. McAdie; Severe Local Storm at Pocatello, Idaho, by A. R.

Teeple; Mammato-cumulus Clouds (illus.), by W. J. Humphreys; Unusual Hailstone Formation (illus.), by D. J. Lingle; and Hail in the Tropics.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and H. W. ANGIER (*Massachusetts Sta. Met. Buls. 283, 284, pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during July and August, 1912. The data are briefly discussed in general notes on the weather of each month.

Annual report of the director of the [Philippine] Weather Bureau for the year 1908, J. ALGUÉ (*Ann. Rpt. [Philippine] Weather Bur., 1908, pt. 3, pp. 276*).—A record of meteorological observations at the secondary stations in 1908.

The influence of climatic conditions on the agricultural industry of Germany, A. SCHNIDER (*Landw. Hefte, 1912, No. 1, pp. 27*).—This is a brief general discussion of the subject.

The conservation of snow, J. E. CHURCH, Jr. (*Sci. Amer. Sup., 74 (1912), No. 1914, pp. 152–155, figs. 11*).—This article describes apparatus and methods used by the Nevada Station in studying the influence of forests in conserving snow on mountains.

It was found that snow tanks or gages were inefficient because of high winds, but that the snow could be quickly and accurately measured by means of the snow sampler described. By means of evaporation measurements it was possible to make allowance for the loss of moisture due to this cause. The only factor left undetermined was that of absorption by the soil. This is "roughly determined for given localities by subtracting the stream flow from the net moisture content of the snow field; that is, the moisture content after due allowance has been made for evaporation. . . .

"The seasonal survey is now being extended to the study of the relation of typical slopes to each other to determine a method of forecasting the probability and magnitude of floods.

"There can no longer be any question of the direct influence of forests in delaying the melting of the snow and thus in retarding stream flow at the very time when floods normally occur. It is also equally true that forests, if too dense, fail to attain their maximum efficiency as conservers of snow. On the other hand, the planting of timber screens at strategic points on exposed slopes will greatly increase their capacity to store more snow."

Drinking water supply of primitive people, A. HABERLANDT (*Mitt. Justus Perthes' Geogr. Anst., 1912, Ergänzungsh. 174, pp. VI+57*).—The subject is discussed mainly from the anthropological standpoint and with special reference to the arid regions of the earth.

SOILS—FERTILIZERS.

Soils of the eastern United States and their use, XXXVIII–XL, J. A. BONSTEEL (*U. S. Dept. Agr., Bur. Soils Circs. 65, pp. 15; 68, pp. 21; 69, pp. 14*).—These circulars discuss the following soil types:

Circular 65, Muck and Peat.—As defined, peat consists of nearly pure, partially decayed remains of vegetable tissue. Muck consists of such material mingled with an appreciable amount of extraneous mineral matter. It is also more completely disintegrated than peat in most cases. Of such areas, nearly 1,000,000 acres have been surveyed and mapped by the Bureau of Soils.

The installation of proper drainage is the first step in the utilization of these soils for crop production. Primarily the soils are best suited for the production of special purpose crops, but considerable areas are used for the growing of general farm produce. Among the special purpose crops which have been grown

with success are cabbage, onions, celery, lettuce, spinach, carrots, beets, turnips, and peppermint. Applications of potash and phosphatic fertilizers, and with many crops lime, have been found especially profitable. Coarse stable manure has also been used to advantage.

Circular 68, Meadow.—The term meadow is here used to designate "those low-lying, frequently somewhat swampy areas found along stream courses and tidewater embayments, which are subject to overflow and which are chiefly devoted to pasturage and the production of hay, when used for agricultural purposes, though usually occupied by trees and dense undergrowth when in their natural condition." Meadow areas of this classification have been surveyed and mapped by the Bureau of Soils in 173 areas in 31 States, aggregating a total of 3,086,829 acres.

The necessity for protection of these soils from overflow and for drainage is pointed out. "In the more northern States the production of grass for mowing or pasturage is the chief use made of the cleared meadow areas. Corn, oats, and market-garden crops are also produced. In the Piedmont Plateau region meadow constitutes some of the best corn soils of the region." In the Southern States the areas are partly devoted to cotton, corn, sugar cane, Bermuda grass, lespedeza, and vegetables, with a growing tendency toward corn and grass production. In the Central and north Central States these soils constitute important grass, corn, and wheat lands.

Circular 69, Marsh and Swamp.—The term swamp is here used to designate all areas which in their natural condition are too wet for the production of any crop. The word marsh designates low, wet, treeless areas usually covered by standing water and supporting a growth of grass and rushes. The marsh is subdivided into fresh water and tidal marshes. Soils of these classes have been surveyed and mapped by the Bureau of Soils to the extent of 2,355,240 acres.

The soils of these areas are well charged with organic matter and may be mucky or peaty. Drainage is the first requisite for their agricultural utilization. In the Middle Atlantic States these soils, when reclaimed, are well suited for the production of corn, cotton, and hay. Some of the tidal marsh areas are devoted to the production of rice of a high quality. In the central prairie States the reclaimed swamp lands constitute some of the most fertile and productive of the corn, oat, wheat, and grass lands.

The soils of Tripoli, P. VINASSA DE REGNY (*Coltivatore, 58 (1912), Nos. 1, pp. 4–8; 2, pp. 38–42, fig. 1; 3, pp. 70–73, figs. 3; 4, pp. 101–105, fig. 1; 5, pp. 135–138, fig. 1; 6, pp. 166–170, fig. 1; 7, pp. 197–201, figs. 2; 8, pp. 231–236, figs. 2; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 6, pp. 1272–1275*).—This is an account of observations on the typical soils of Tripoli, viz, the oasis sand, the desert sand, and the soils of Cyrenaica.

The oasis sand is stated to be very fertile. The soil is decidedly sandy, being composed of about 12 per cent gravel (over 1 mm. in diameter), 15 per cent coarse sand ($\frac{1}{2}$ to $\frac{1}{4}$ mm.), with about 90 per cent of the remainder of colloidal character. Of the soil material 46 per cent is soluble in hydrochloric acid. The carbonates form about 43 per cent of the soil.

The desert sand lies between the coast and the Jebel. The sand particles of this soil exceed 71 per cent, whereas the colloidal material is below 29 per cent. Scarcely 6.5 per cent of the soil is soluble in hydrochloric acid. This soil differs from the oasis sand in having a smaller percentage of coarse constituents and of calcium carbonate. The proportion of these constituents, however, increases gradually with the length of time that the soil has been under cultivation, the calcium carbonate being as high as 44 per cent in the older gardens and as low as 2.5 per cent in the newer gardens.

The rainfall in this section is too small to produce chemical decomposition in the soil. It is believed that the possibilities are excellent for utilizing the waters, which are retained under the sand by an impervious clay formation and afford an abundant and easily accessible supply of water.

Cyrenaica contains large areas of red soils of a clayey nature and high water-retaining power. The organic constituents varied from 3.9 to 8.3 per cent; potash from 0.14 to 0.83 per cent; phosphoric acid from 0.11 to 0.79 per cent; and nitrogen from 1 to 1.5 per cent.

Researches on properties of peat soils of Picardy, E. COQUIDÉ (*Recherches sur les Propriétés des Sols Tourbeux de la Picardie. Paris, 1912, pp. 180, pls. 9, figs. 24; abs. in Bul. Soc. Nat. Agr. France, 72 (1912), No. 6, pp. 507–509; Rev. Gén. Sci., 23 (1912), No. 16, pp. 641, 642*).—This is an account of investigations on the character of the vegetation and the chemical and physical properties of these soils.

It is stated that the vegetation of large areas of these peat lands is similar to that of arid regions. This peculiarity is attributed to the fact that, although the absorptive power of the soil for water is enormous, the water is not given up to the plants until the point of saturation is reached. The soils are in very poor physical condition and are also deficient chemically.

Black soils (chernozem), P. KOSSOVICH (*Die Schwarzerde (Tschernosiom). Vienna, Berlin, London, 1912, pp. 156+VIII, figs. 20*).—This has already been noted from another source (E. S. R., 26, p. 812).

Gray sand and ortstein, H. NIKLAS (*Naturw. Ztschr. Forst u. Landw., 10 (1912), No. 7, pp. 369–379*).—This is a summary of the present knowledge on the formation and composition of ortstein and gray sand.

The chemical composition of red saline clay, E. MARCUS and W. BILTZ (*Ztschr. Anorgan. Chem., 77 (1912), No. 1, pp. 119–123*).—Detailed analyses of samples of red clay obtained from Schönebeck are compared with the chemical composition of blue clays from the same source and of clays from various other sources. The characteristic difference in color of the Schönebeck clays is shown to be due to the differences in amount and form of iron present.

A peculiarity of the mole, H. M. GMELIN (*Cultura, 24 (1912), No. 287, pp. 277–279*).—The author found that the calcium carbonate content of the subsoil transported by moles to the surface was much higher than that of the surface soil. This led him to believe that the results of hydrochloric acid tests of the lime requirements of soils may be unreliable if the sample of soil happens to be taken from a mole hill, and this may be unavoidable owing to the smoothing over of the hills by mechanical agencies.

The cause of the absorbent power of soils, U. PRATOLONGO (*Staz. Sper. Agr. Ital., 45 (1912), No. 1, pp. 5–54; abs. in Chem. Zentbl., 1912, I, No. 13, p. 1048*).—This article gives in some detail the results of studies of the action of saline solutions on zeolites, leucite, and soils. Among the more important conclusions reached is that the absorptive power of soils can not be explained by the formation of solid solutions. See also a previous note (E. S. R., 25, p. 21).

A method of retaining water in the soil, K. KREBS (*Illus. Landw. Ztg., 32 (1912), No. 32, p. 307; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 6, p. 1280*).—Comparative tests of different methods of planting crops with a view of holding the maximum amount of snow and thus increasing the water supply in the soil are reported.

The cooperation of organisms in clay formation, P. ROHLAND (*Biochem. Ztschr., 39 (1912), No. 3–4, pp. 205–207; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 595, II, p. 484*).—"The odor of certain clays, which can be removed by ferric saccharate solutions, suggests to the author the possibility that clay may owe its formation to the action of micro-organisms."

The flocculating power of some soluble salts on the clay substances of the soil, G. Masoni (*Staz. Sper. Agr. Ital., 45 (1912), No. 2, pp. 113–159; abs. in Chem. Centbl., 1912, I, No. 18, p. 1496; Jour. Soc. Chem. Indus., 31 (1912), No. 10, p. 504; Jour. Chem. Soc. [London], 102 (1912), No. 597, II, pp. 677, 678*).—"From the results of a large number of experiments the author concludes that chlorids have a greater flocculating power than nitrates and sulphates. Calcium salts are more active than potassium and ammonium salts, and the latter are more active than sodium salts. There appears to be no simple relation between the quantity of a salt and its flocculating power, but the flocculating power of the solution of a salt depends upon the ionic concentration and the degree of dissociation. . . .

"The flocculating power is a function of the cation, the anion being without influence. The flocculating power depends upon the valency of the cation, but not upon its atomic weight. If the value of the flocculating power for the sodium ion be taken as 1, then for the potassium or ammonium ion it is 2.4 and for the calcium ion 5.7. The flocculating power of a salt on the clay substance of a soil is directly connected with the absorptive power of the soil for the salt, and may be regarded as due to an interchange of radicals between the salt and the soil."

Biochemical studies on soils subjected to dry heat, F. J. Seaver and E. D. Clark (*Biochem. Bul., 1 (1912), No. 3, pp. 413–427, pl. 1*).—A study of extracts from soils subjected to different temperatures showed that the color and soluble matter varied with the temperature but not with the length of time of heating. The growth of oats was slightly increased in soils heated at low temperatures, 90 to 120° C., but was retarded progressively as the temperatures increased above this point.

"Retardation seems not to be due to the toxic effects of the substances rendered soluble, but to the fact that they are present in such large quantities that the plant is unable to absorb them. The influence of heated soils on the growth of fungi is the opposite of that on the growth of green plants, the growth becoming more luxuriant as the temperature is increased. This can be explained by the fact that fungi, unlike most green plants, have the power of adapting themselves to nutrient media of a comparatively high degree of concentration. The beneficial or harmful results, therefore, of the heating of a soil for the growth of plants depends upon the temperature to which the soil has been heated as well as upon the nature of the soil and the plant. The preference of certain plants for burned-over areas or for peaty soils may be explained by the acidity of such situations, a supposition we are testing by blueberry-culture experiments now under way."

Bacterial slimes in soil, R. Greig-Smith (*Proc. Linn. Soc. N. S. Wales, 36 (1911), pt. 4, pp. 609–612; Centbl. Bakt. [etc.], 2. Abt., 34 (1912), No. 8–9, pp. 226, 227*).—This note briefly presents evidence which is thought to indicate the presence of bacterial slimes in soils.

The determination of Rhizobia in the soil, R. Greig-Smith (*Proc. Linn. Soc. N. S. Wales, 36 (1911), pt. 3, pp. 492–503; Centbl. Bakt. [etc.], 2. Abt., 34 (1912), No. 8–9, pp. 227–229*).—A medium specially suited to this purpose is described.

The rôle of Streptothrix in the soil, A. Fousek (*Mitt. Landw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien, 1 (1912), No. 2, pp. 217–244*).—Determinations of the number of *Streptothrix chromogena* and *S. alba* in different soil types and studies of the assimilation of nitrate, ammoniacal, and amid nitrogen, and free nitrogen of the air by these organisms and their effect on the decomposition of peptone, dried blood, bone meal, and straw, and on the growth of plants are reported.

The results show that Streptothrix composed from 20 to 30 per cent of the micro-organisms in loam soils, from 8 to 15 per cent in clay soils, and from 7 to 10 per cent in sands. Fallow soils contained larger numbers than cultivated soils. The organisms were also abundant on roots of Aspidium, Quercus, Ulmus, Gramineæ, and Papilionaceæ, and on decaying plant débris.

Streptothrix decomposed peptone, blood, bone meal, and straw, splitting off large quantities of ammonia. For culture purposes media containing milk sugar and grape sugar were especially well adapted. Cellulose may also be used as a source of carbon. The optimum temperature for the development of the organisms was 20° C., although there was a good, but very slow, development at lower temperatures.

Streptothrix produced no nitrification. On the other hand, there was strong reduction of nitrates to nitrite, but without direct denitrification, i. e., without loss of free nitrogen.

In view of the ready assimilation of nitrates, ammonium compounds, urea, and uric acid, it would appear that these organisms are instrumental to a prominent degree in fixing the nitrogen of fertilizers and soils and thereby diminishing the loss from denitrification. There was no assimilation of free nitrogen by Streptothrix, but the presence of these organisms did not diminish the assimilative capacity of Azotobacter for free nitrogen.

Streptothrix had a favorable effect on the growth of certain plants. This may be regarded as being due to the rapid decomposition of the organic matter whereby plant nutrients, especially assimilable nitrogenous compounds, are set free. It would also seem that these organisms aid in the production of nodules on Papilionaceæ.

The agricere and the bacteriotoxins of the soil, R. Greig-Smith (*Proc. Linn. Soc. N. S. Wales, 36 (1911), pt. 4, pp. 679–699; Centbl. Bakt. [etc.], 2. Abt., 34 (1912), No. 8–9, pp. 224–226*).—The author reports experiments which led him to believe that the chief reason for the increased bacterial activity in soils following antiseptic treatment with such fat solvents as chloroform, ether, etc., is the removal of the fatty protective covering of the soil particles (agricere) referred to in a previous article (E. S. R., 25, p. 525).

Beneficial effect of creatinin and creatin on growth, J. J. Skinner (*Bot. Gaz., 54 (1912), No. 2, pp. 152–163, fig. 1*).—In water cultures with wheat seedlings creatinin and creatin increased growth both in presence and in absence of nitrate. These substances were apparently able to replace nitrates in plant growth. They also increased the assimilation of phosphoric acid and potash.

Partial sterilization of soil, R. B. McBride (*Pharm. Jour. [London], 4. ser., 34 (1912), No. 2527, p. 381; abs. in Chem. Abs., 6 (1912), No. 15, pp. 2127, 2128*).—It is reported that the growth of sweet peas was increased by sprinkling the soil with a solution of potassium permanganate, 2 oz. to 25 gal. of water. The solution was also effective in destroying the green fly on rose bushes.

Partial sterilization of soil for greenhouses, E. J. Russell and F. R. Petherbridge (*Pharm. Jour. [London], 4. ser., 34 (1912), No. 2524, pp. 286, 287*).—This is an abstract of an article already noted from another source (E. S. R., 26, p. 815).

Clearing heavy lands as adapted to Montaja and Panendjoan, E. Van Lennep (*Teysmannia, 23 (1912), No. 4, pp. 211–229, pls. 4*).—The author describes a so-called ditching system of clearing, cultivating, and aerating land overgrown with dense second growth of shrubbery and grasses and isolated trees. The method is stated to be extensively and successfully used in the preparation of land for the cinchona plant in different sections of Java.

Reclamation of crawfish lands, W. D. Garrison (*South Carolina Sta. Bul. 167, pp. 12, pls. 10*).—The term crawfish lands is taken to represent the lower

coastal region of South Carolina. In order to determine the agricultural value of these lands, experiments were made at the coast substation near Charleston during 1909 and 1910 in tile draining and the production of different vegetables, oats, corn, and cotton under applications of various fertilizer mixtures and materials. The drainage system was planned and partly installed by the Office of Experiment Stations.

The results showed a marked profit from all the crops grown on the drained land. Lime in conjunction with a complete fertilizer was especially beneficial.

"The theory held by some people that the drainage of this land was impracticable, and that even if the water could be successfully removed the land would not be productive, has been entirely overthrown by the record of the past 2 years."

Sponge spicules in swamp soils, R. O. E. DAVIS (*U. S. Dept. Agr., Bur. Soils Circ. 67, pp. 4, fig. 1*).—Microscopic examinations of swamp soils of Georgia showed a large number of spicules, the remains of fresh-water sponges, in the surface 6 in. of soil. These spicules were found to cause irritation of the feet of animals. *Mavenia millsii* was the most common of the spicules. Examinations of other soils from different parts of the United States showed only small quantities of spicules of a variable character. Applying soil free from spicules, as by mixing in some of the subsoil, is suggested as the most practical means of overcoming the difficulty.

Sponge spicules in certain soils, R. O. E. DAVIS (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *15* (*1912*), *Sect. VII, pp. 77–79*).—See above.

Present status of fertilizer investigations, F. K. CAMERON (*Amer. Fert., 37* (*1912*), *No. 2, pp. 31–33*).—This is a brief review in which it is maintained that "the present status of fertilizer investigations, both theoretical and practical, is one of unrest and doubt."

Some secondary actions of manures upon the soil, A. D. HALL (*Agr. Gaz. Tasmania, 20* (*1912*), *Nos. 2, pp. 54–59; 3, pp. 81–84; 4, pp. 144, 145; 5, pp. 182–188; 6, pp. 215–218*).—The more important points discussed in this article are summarized as follows:

"The long-continued use of sulphate of ammonia on soils poor in lime results in the soils becoming acid. The acidity is caused by certain microfungi in the soil which split up the sulphate of ammonia in order to obtain the ammonia, and thereby set free sulphuric acid. The infertility of such soils is due to the way all the regular bacterial changes in the soil are suspended by the acidity; instead, fungi permeate the soil and seize upon the manure. The remedy, as may be seen upon the Woburn plats, is the use of sufficient lime to keep the soil neutral. From the Rothamsted soils carbonate of lime is being washed out at the rate of 800 to 1,000 lbs. per acre per annum, the losses being increased by the use of sulphate of ammonia, but lessened by dung or nitrate of soda. Nitrate of soda, when applied to heavy soils in large quantities, destroys their texture. Some of the nitrate of soda gets converted into carbonate of soda by the action of plants and bacteria, and carbonate of soda, by deflocculating the clay particles, destroys the tilth. The best remedies are the use of soot or superphosphate, the best preventive is the use of a mixture of nitrate of soda and sulphate of ammonia instead of either separately. Soluble potash manures and common salt may also injure the tilth of heavy soils through the production of a little soluble alkali by interaction with carbonate of lime in the soil. The remedy is to apply such manures in the winter or in conjunction with superphosphate."

A biological method of preserving manure, C. BARTHEL and S. RHODIN (*Deut. Landw. Presse, 39 (1912), Nos. 50, pp. 583, 584; 51, pp. 597, 598*).—In previous experiments (E. S. R., 18, p. 918) one of the authors showed that the loss of ammonia from manure could be reduced by setting up lactic-acid fermentation in the manure. In further tests of the method, here reported, it was found that the addition of from 50 to 100 liters of whey to 1,000 kg. of manure (sprinkled on each layer) greatly reduced the loss of ammonia from the manure. The fertilizing efficiency as determined in experiments with potatoes, beets, oats, and rye was only 59 per cent as great for the untreated as for the treated manure.

Certain relations between the ash constituents of various fertilized plants, G. LEONCINI (*Staz. Sper. Agr. Ital., 45 (1912), No. 1, pp. 55–75; abs. in Chem. Zentbl., 1912, I, No. 13, p. 1049*).—This is a preliminary report giving the results of a considerable number of analyses of plants fertilized in different ways, from which the author concludes that phosphoric acid is taken up by the plant most readily in presence of calcium and magnesium salts, less readily in the presence of potash salts.

Utilization of atmospheric nitrogen, T. H. NORTON (*U. S. Dept. Com. and Labor, Bur. Manfr., Spec. Agents Ser., 1912, No. 52, pp. 178, figs. 5; abs. in Daily Cons. and Trade Rpts. [U. S.], 15 (1912), No. 149, p. 1309*).—This monograph describes in detail the present supply of nitrogen, and the scientific and technical features of the various processes which have been proposed for the production of ammonia and nitric acid from the air, as well as the technical and commercial aspects of the new industry which has been established through the practical application of certain of these processes. A short chapter is also devoted to the question of the utilization of coal waste and peat as sources of ammonia. A bibliography of the more important papers on the subject is given at the end of the report.

Discussing the possibilities of employing the new processes under American conditions, the author emphasizes the following points:

"The synthetic production of nitric acid from the atmosphere is a highly specialized process, dependent for the time being on exceptionally cheap sources of electricity. Many are laboring upon the problem of increasing the output per unit of electric power. Such experiments are most advantageously conducted in connection with the gigantic plants in Scandinavia.

"The case is different with cyanamid. Here is a product that can be easily produced wherever calcium carbid is manufactured. Its value as a fertilizer becomes more manifest each year. The items of its cost are easily controlled. It is a material from which our stock of cyanids can be economically produced. At present we send abroad annually $750,000 for various cyanids. It is susceptible of application on a large scale in gold mining. In 1910 imports of cyanamid reached $40,000, so that evidently its use in agriculture is recognized. The establishment of cyanamid works at several points on American soil, where water power is relatively cheap and earnest propaganda in connection with the employment of the new fertilizer in farming would constitute an important step in freeing our country from dependence upon foreign sources of combined nitrogen.

"The same may be said to some extent, but with considerable reserve, in regard to aluminum nitrid. The manufacture of the compound involves even less power than that of cyanamid, and the transformation of the combined nitrogen into the form of ammonia is less expensive than in the case of cyanamid. Granting the correctness of the claims made in favor of this latest

nitrogen industry, the United States is certainly one of the countries specially favored for the establishment of the manufacture, as it possesses fairly extensive deposits of bauxite, the mineral serving for the fixation of nitrogen. There is much to warrant American enterprise in studying very closely the possibilities of this new industry. It promises to furnish ammonium compounds far more economically than any existing process and involves a simpler plant than that required for cyanamid or air nitrates. . . .

"It will be noted that at present the methods of producing ammonia and ammonium compounds, more particularly the staple product, ammonium sulphate, seem to offer the larger field for the economic fixation of atmospheric nitrogen. The more complete utilization of the nitrogen present in coal, peat, etc., increases likewise the available supply of ammonia. In view of this trend in the general movement, coupled with the prospective depletion of the stock of Chile saltpeter, it is eminently desirable that steps should promptly be taken to ascertain, as nearly as possible, under what conditions and to what extent ammonium sulphate can satisfactorily replace Chile saltpeter for the most important crops.

"There is much diversity of opinion on this point, both in Europe and America. Some authorities assign to nitrogen in the form of ammonia a general value as fertilizer equal to that of nitrogen in the form of saltpeter. Others assign a lower value. Market quotations fluctuate, following naturally the laws of supply and demand, but frequently they show a higher valuation of ammonia nitrogen than of nitrogen in the form of nitrate. More definite data on this subject might aid naturally the plans of American investors in handling projects for establishing on American soil adequate plants for the domestic production of combined nitrogen.

"In conclusion it can be regarded as beyond doubt that the present achievements of applied chemistry in this field render it possible for American industry and American agriculture to face the threatened exhaustion of the nitrate deposits of Chile and the demands attendant upon a rapidly growing population without any feeling of apprehension. The processes already perfected and described in detail show that there is no early danger of a nitrogen famine. The continual perfection of the processes and the appearance at frequent intervals of novel additional methods, as well as the popularization of the new forms of combined nitrogen, all point to a steady movement forward, and to the assurance that combined nitrogen, as an industrial product, will be furnished on an increased scale without advance in cost above existing rates as fast as the demand is evident."

The fixation of atmospheric nitrogen by the use of aluminum nitrid, F. MARRE (*Génie Civil, 61 (1912), No. 2, pp. 30–33; abs. in Chem. Abs., 6 (1912), No. 15, p. 2130*).—The theory and the practical operation of this method of fixation of free nitrogen are described. A product is obtained which is not a definite compound, but contains about 31 per cent of nitrogen.

The behavior of commercial calcium cyanamid in storage and under the influence of soils and colloids, G. HENSCHEL (*Das Verhalten des technischen Calcium-cyanamids bei der Aufbewahrung sowie unter dem Einfluss Kulturböden und Kolloiden. Diss. Leipzig, 1912, pp. 72; abs. in Centbl. Bakt. [etc.], 2. Abt., 34 (1912), No. 10–13, pp. 279, 280*).—The author found that the decomposition of cyanamid was somewhat more rapid in dry sterilized soils and colloids than in those which contained micro-organisms. There was almost complete agreement between the intensity of cyanamid decomposition in sterilized media and ammonia formation in media containing micro-organisms. This was true for practically all soils experimented with except a humus moor sand rich in colloids and showing feeble bacterial activity. It was shown that the

humus of the soil was of special importance in connection with the cyanamid decomposition. There was an active formation of urea in cyanamid in storage, but no loss of nitrogen was observed.

Further investigations on lime nitrogen, C. J. Milo (*Meded. Proefstat. Java-Suikerindus., 1912, No. 16, pp. 427–527, pls. 6, fig. 1; Arch. Suikerindus. Nederland. Indië, 20 (1912), Nos. 15, pp. 431–472, pl. 1, fig. 1; 16, pp. 481–539, pls. 5*).—This is a continuation of work previously noted (E. S. R., 25, p. 826). The results of the whole investigation are summarized in the abstract below.

Lime nitrogen as regards its transformation in the soil, C. J. Milo (*Meded. Proefstat. Java-Suikerindus., 1912, No. 20, pp. 601–634; Arch. Suikerindus. Nederland. Indië, 20 (1912), No. 27, pp. 1039–1072; abs. in Chem. Zentbl., 1912, II, No. 16, p. 1393*).—Previous investigations by the author (see above) dealt with the question of the transformation of lime nitrogen in storage. The present report gives an account of experiments to determine the transformation processes, fertilizing value, and effect of this material in the soil under Java conditions. A light and a heavy soil type were used in the experiments. The more important results of these studies are summarized as follows:

The lime nitrogen absorbed moisture and carbon dioxid from the atmosphere. Under such conditions there was a loss of nitrogen by volatilization. By storing the material under dry conditions the loss of nitrogen was reduced to a minimum. Calcium cyanamid during storage formed various decomposition products which depended to a more or less extent on the time, humidity of the atmosphere, and the temperature.

In heavy soils the fertilizing value was less for the old than for the new product, and for this reason the Kjeldahl method did not give a true estimate of the fertilizing value of the material.

Cyanamid was much less readily soluble in water than ammonium sulphate. Less cyanamid than ammonia was absorbed by the soil.

The transformation of lime nitrogen varied considerably as between heavy, strongly absorbent soils containing colloidal and catalytic substances and light, less absorbent soils. In the first type of soil the transformation was in two consecutive stages—(1) the production of cyanamid followed quickly by urea and (2) the formation of ammonium carbonate from the urea. The first is due to a chemico-physical action, whereas the second is most probably brought about by micro-organisms. The ammonia was readily absorbed by the heavy soil.

In case of the light soil the calcium cyanamid formed basic calcium cyanamid salts and free cyanamid. These compounds remained stable in the soil and were slowly transformed into ammonia, this slowness of transformation giving a chance for the production of dicyandiamid. The toxic action of lime nitrogen in light soils when the fertilizer is applied at the time of seeding was due to the presence of the cyanamid in the soil in its unchanged condition. Cyanamid was strongly toxic to plants.

Dicyandiamid, even in large amounts, did not prevent the germination of seeds. In the later stages of growth of the plants dicyandiamid had a tendency to cause a temporary drying of the tips and edges of the leaves.

In the heavy, strongly absorbent soils rich in colloidal and catalytic substances the toxic action of the cyanamid was lessened largely by the hydrolysis of cyanamid to urea. In case of the light soils with little colloidal and catalytic substances, the hydrolysis of the cyanamid may be prevented and polymerization to dicyandiamid may take place. A thorough covering and careful distribution of the lime nitrogen in the soil and an intimate contact of the colloidal and catalytic material with the calcium cyanamid tend to expedite the necessary transformation of the cyanamid to urea.

On the basis of the foregoing investigations the author makes the following practical suggestions:

Lime nitrogen is not adapted for top dressing or to acid soils and can not be recommended for light soils of low absorbent power.

Unusually heavy applications can not be recommended. In order to avoid dusting, it is recommended that the fertilizer be mixed with soil, though in some cases where there is little or no wind this may not be necessary.

Lime nitrogen should not be mixed with soluble phosphatic fertilizers, but mixing with potash salts is allowable if desired. The fertilizer should be applied from 4 to 14 days before seeding, the shorter periods being recommended for the heavy soils, with a longer period of time on light soils. It is recommended that the fertilizer be immediately and carefully covered and well mixed with the soil. In view of the fact that cyanamid is less readily absorbed than ammonia, heavy applications of water are not desirable until the transformation of the cyanamid to ammonia has taken place.

New observations on the behavior of nitrate in cultivated soil, J. VOGEL (*Centbl. Bakt. [etc.], 2. Abt., 34 (1912), No. 18–22, pp. 540–561; abs. in Chem. Ztg., 36 (1912), pp. 1104, 1105; Jour. Soc. Chem. Indus., 31 (1912), No. 20, p. 1000; Chem. Abs., 6 (1912), No. 23, p. 3485*).—Previous investigations having shown that there was a loss of free nitrogen from ammoniacal and nitrate nitrogen added to soils receiving calcium carbonate (E. S. R., 26, p. 226), the author made further studies to determine the influence of aeration of the soil on such loss of nitrogen from nitrates, using per 100 gm. of soil 0.32 gm. of sodium nitrate and 0.9 gm. of calcium carbonate. The water content of the soil was kept constant during the experiment and the soil was placed in shallow layers in porcelain dishes and frequently stirred to provide aeration.

The results of the first series of experiments seemed to indicate that the loss of nitrogen in the transformation of the nitrates might be due to evaporation of water from oversaturated soil particles. In later trials, however, the evaporation of water from the soil was controlled, but still there was loss of free nitrogen. This loss occurred in all cases where the original water content of the soil was kept constant for a considerable time during the course of the experiment. A water content of about 15 per cent was sufficient to bring about the transformation. The soil changed in its physical appearance, becoming dry and powdery after a few days.

Apparently the nitrates were transformed suddenly and with great energy, and the resulting sodium carbonate brought about the changed appearance of the soil. The transformation process is thought to be a purely chemical one in which the nitrate nitrogen is in part reduced to lower oxids of nitrogen.

Influence of organic substances on the decomposition and action of nitrogenous compounds, GERLACH and DENSCH (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 4 (1912), No. 4, pp. 259–317*).—In pot experiments with a loamy soil moderately supplied with organic matter it was found that the addition of easily decomposable organic compounds, such as grape sugar or straw, resulted in the conversion of soluble nitrogen salts, like ammonium sulphate and sodium nitrate, into insoluble protein compounds, which, however, were later readily decomposed and assimilated by plants. In soil receiving no applications of organic matter there was a distinct gain in total nitrogen in 2 months. With additions of grape sugar, straw, ammonium sulphate, and sodium nitrate the results were variable and inconclusive in this respect.

The action of lime nitrogen and calcium nitrate in the field, GERLACH (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 4 (1912), No. 4, pp. 318–333*).—In field experiments with oats, rye, and potatoes lime nitrogen proved distinctly inferior and commercial calcium nitrate about equal to sodium nitrate.

The phosphate deposits of the United States, W. H. WAGGAMAN (*Amer. Fert., 37 (1912), No. 2, pp. 34–36*).—This is a brief description of the phosphate deposits of the United States, with notes on their exploitation.

The composition of certain Palestine phosphates and their fluorin content, G. DANELLI (*Rend. Soc. Chim. Ital., 2. ser., 4 (1912), No. 7, pp. 165–173*).—Reports by other investigators on these phosphates are reviewed, and detailed analyses of a number of samples are presented. These show from 25.5 to 39.28 per cent of phosphoric acid and from 3.5 to 4.88 per cent of fluorin. The amount of calcium carbonate present varies widely, ranging from 1.87 to 33.73 per cent. The peculiar characteristics and geological relationships of these phosphates are briefly discussed.

The utilization of the phosphates of central Russia (*Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 6, pp. 1286–1290*).—This is a brief summary of information on this subject with a number of references to the literature.

It is stated in brief that "in central and eastern Russia there are extensive phosphate deposits sufficient for the needs of that part of the country. These minerals, though not rich enough to interest directly the international market, do so indirectly, because when industrially prepared they might emancipate the above regions from the importation of foreign phosphatic manures. The utilization of the above phosphates is important also from the point of view of international agricultural production, for by favoring the consumption of manures, which at present is hampered by the cost of carriage, it promotes the development of agriculture in these important cereal and flax producing regions."

[Experiments with different phosphates], D. N. PRIANISHNIKOV ET AL. (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscou), 18 (1912), No. 1, pp. XIII+1–179, figs 17*).—Accounts are given of experiments in the preparation of superphosphates from different Russian phosphorites, and of tests of the fertilizing value of various kinds of crude and manufactured phosphates.

It was found in general that certain of the Russian phosphorites could be economically converted into superphosphate. The crude phosphates showed a low fertilizing value when used on sandy soils. Superphosphates and precipitated phosphates prepared from the crude phosphates, however, showed a decidedly higher fertilizer efficiency. So-called Viborg phosphate, prepared from various crude phosphates (by fusion with sodium carbonate), proved more effective than phosphatic slag.

Tests of the treatment of steamed bone and crude phosphate with potassium bisulphate indicated that this method may replace the use of sulphuric acid in the manufacture of superphosphates from bones and natural phosphates. The addition of iron bisulphid to crude phosphate was found to decrease the yield. Additions of small amounts of ferrous and ferric sulphates were without effect, but larger amounts were injurious. The addition of ammonium chlorid favored the solution of the phosphate, and mixtures of ammonium chlorid and sodium nitrate were more effective in this respect than sodium nitrate alone. With the most favorable combination the yield was very nearly as great as with superphosphate. Mixtures of calcium nitrate and ammonium sulphate exerted very favorable action on crude phosphates, Thomas slag, and bone meal.

In experiments with oats the addition of peat exerted no favorable effect upon the assimilation of the phosphates.

Field investigations for potash in America, H. S. GALE (*Amer. Fert., 37 (1912), No. 2, pp. 38–40*).—A brief summary is given of the work undertaken and the results obtained by the United States Geological Survey in its search for potash supplies in this country.

Alunite as a source of potash, W. H. Waggaman (*U. S. Dept. Agr., Bur. Soils Circ. 70, pp. 4, figs. 2; Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 15 (1912), Sect. VII, pp. 375–379, figs. 2*).—This circular describes the method and apparatus used to determine the temperature at which complete decomposition of alunite takes place. It was found that at a temperature of 700° C. alunite is completely decomposed, yielding a residue of potassium sulphate and alumina. The alunite used in these experiments contained 26.88 per cent of sulphur trioxid over and above that required to combine with the potash present. Only 23.05 per cent, however, was recovered on ignition, indicating a considerable loss as sulphur dioxid at the high temperature of ignition used. The ignited residue contained 15.95 per cent of potash and 15.37 per cent of sulphuric acid (SO_3). It is estimated that a ton (2,000 lbs.) of pure alunite will yield 220 lbs. of potash, 1,090 lbs. of sulphuric acid, and 740 lbs. of aluminum, worth in the aggregate $13.88.

In view of the difficulty and expense of leaching potassium sulphate from the ignited material, it is thought to be "more practical to use the ignited alunite (free from soluble aluminum compounds) directly as a fertilizer either alone or in mixed goods, since the expense of separating the soluble salts from the alumina would probably more than counterbalance the value of the alumina obtained. The percentage of potash in the ignited residue is considerably greater than in kainit, our chief source of soluble potash."

The extraction of potash from silicate rocks, W. H. Ross (*U. S. Dept. Agr., Bur. Soils Circ. 71, pp. 10; Amer. Fert., 37 (1912), No. 4, pp. 44–49*).—This article describes and discusses the relative efficiency of various processes which have been proposed for this purpose. It is stated that "on account of its simplicity the method of decomposing feldspar by heating with calcium carbonate and with calcium chlorid (or sodium chlorid) could undoubtedly be carried out on a large scale without involving any serious mechanical difficulty, and the method would thus be a practical one providing the value of the products obtained would compensate for the expense involved," but the author is of the opinion "that any method to be economical must produce at the same time other products of value in addition to the potassium."

Action of magnesium [and manganese] fertilizers and of boric acid, P. Andouard (*Engrais, 27 (1912), No. 29, pp. 796–799*).—Experiments on a variety of crops with a basic magnesium fertilizer with manganese (manganese carbonate) and with boric acid gave as a rule inconclusive results. The only fact which appeared to be definitely determined was that such fertilizers should not be applied broadcast, but should be thoroughly mixed with the soil.

Studies on catalytic fertilizers, E. Boullanger (*Ann. Sci. Agron., 4. ser., 1 (1912), I, No. 3, pp. 161–180; Ann. Inst. Pasteur, 26 (1912), No. 6, pp. 456–466; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 9, pp. 1955, 1956*).—In pot experiments with manganese chlorid, alone and combined with other fertilizing materials, it was found that the use of the manganese fertilizer resulted in a marked increase in the yield of potatoes, but was practically without effect on barley. In similar experiments with so-called manganose and lime manganate, it was found that the manganese fertilizers increased the yield of oats, peas, and clover to a marked extent, particularly in the presence of potash salts and of a complete fertilizer containing potash.

Experiments are also reported in which manganese sulphate was compared with aluminum sulphate, sodium silicate, ferrous sulphate, uranium sulphate, and flowers of sulphur on a variety of vegetables. The effect of these substances was variable, but in the majority of cases the yield was increased. The action of flowers of sulphur was especially favorable.

On the basis of these experiments the author classifies the catalytic fertilizers as specially favorable to each crop as follows: Carrots, sulphur, aluminum sulphate, manganese sulphate, sodium silicate; beans, sulphur; celery, sulphur, ferrous sulphate, sodium silicate, manganese sulphate, aluminum sulphate; spinach, sulphur; lettuce, sulphur, manganese sulphate, ferrous sulphate, aluminum sulphate; sorrel, sulphur, manganese sulphate; chicory, sulphur, aluminum sulphate; potatoes, aluminum sulphate, sodium silicate, ferrous sulphate, sulphur; onions, aluminum sulphate, ferrous sulphate, and sulphur.

From experiments with sulphur on sterilized and unsterilized soil, the author concludes that the favorable action of sulphur is probably due to its influence in modifying the bacterial flora of the soil and hindering the growth of certain organisms.

The stimulating action of manganese, QUANTE (*Deut. Landw. Presse, 39 (1912), No. 83, pp. 961, 962*).—This article briefly reviews the work of several investigators on this subject, especially that of Boullanger noted above.

The author concludes that the experimental results show a marked benefit under certain conditions from the use of manganese compounds as fertilizer, but that some of the conclusions regarding the agricultural value of these compounds are too optimistic. Their actual agricultural value can be finally determined only by further practical trials under farm conditions.

Study of sulphur as a fertilizer, F. GIANNETTO (*Bol. Quind. Soc. Agr. Ital., 17 (1912), No. 14, pp. 425–429*).—Experiments with sulphur alone and combined with different fertilizing materials on potatoes are reported, showing that sulphur applied alone at the rate of 400 lbs. per acre resulted in a net loss. When applied with other fertilizers, there was a decided net profit.

Utilizing sludge in Bradford, England (*Municipal Jour., 32 (1912), No. 19, pp. 708, 709*).—Brief reference is made to profits obtained from sewage grease and sludge fertilizer, the plant for the preparation of which is being greatly extended.

City street sweepings as a fertilizer, J. J. SKINNER and J. H. BEATTIE (*U. S. Dept. Agr., Bur. Soils Circ. 66, pp. 8, figs. 2; Jour. Indus. and Engin. Chem., 4 (1912), No. 8, pp. 604–606, figs. 2*).—This circular reports analyses and wire-basket tests on wheat, corn, and radishes of 3 samples of street sweepings, (1) the débris secured by hand sweeping with a brush, (2) that secured by sweeping with a machine, and (3) the decomposed material from a dump pile which had been accumulating for some time. The first contained 1.34 per cent nitrogen, 0.71 per cent potash, and 1.03 per cent phosphoric acid; the second, 0.86 per cent nitrogen, 0.55 per cent potash, and 0.55 per cent phosphoric acid; and the third, 0.60 per cent nitrogen, 0.56 per cent potash, and 0.60 per cent phosphoric acid

In general, increased growth followed the use of all 3 materials, but the decomposed sweepings were least effective. The fertilizing effect of the sweepings was increased by extraction of the oil which they contained, and after such treatment they were practically as effective as stable manure. It appears, therefore, that oil is a deleterious constituent of the sweepings.

Review of progress in the fertilizer industry, 1909–1911, G. WICHERN (*Chem. Ztg., 36 (1912), Nos. 37, pp. 329–331, figs. 3; 39, pp. 354, 355, figs. 2; 43, pp. 389–392, figs. 6; 46, pp. 420, 421, figs. 5; 47, pp. 434–436, figs. 5; 51, pp. 474, 475; 52, pp. 482–484*).—This is a review of statistics of production and consumption of fertilizers in the principal countries of the world, of development of old and new sources of fertilizing materials, of methods of analysis, and of manufacturing processes and machinery.

[Fertilizers] (*Fla. Quart. Bul. Agr. Dept., 22 (1912), No. 2, pp. 159–169, 173–185*).—This is a report on fertilizer inspection in Florida, with analyses of fertilizers examined to April 1, 1912.

AGRICULTURAL BOTANY.

A comparison of the alterations in the velocity of growth of certain seedlings through the action of rapid and slow electrons of the β-rays of radium, also a comparison of the rôle of chemical make-up and of physical factors in determining these alterations, E. D. CONGDON (*Arch. Entwickl. Mech. Organ., 34 (1912), pt. 2, pp. 267–280, figs. 2*).—A study was made of the growth-retarding effects upon small seeds of the rapid and slow electrons of the β-radiations and also of the relative importance of physical factors and of chemical composition in determining the sensitiveness of seeds to exposures to radium. Five kinds of seeds were used, viz, black mustard, millet, poppy, Nicotiana, and Amarantus.

It was found that by changing the penetrating power of the electrons their effect was greatly modified. The embryos of mustard and millet were chiefly affected, from which it is inferred that the embryo appeared more sensitive than the stored foodstuff. It is thought probable that in the embryo there was some injury of ferments or some unfavorable change of the general conditions of solution rather than the breaking down of certain compounds which retarded the growth.

The slower electrons of the β-radiations were found to have a greater retarding action than the more rapid ones in proportion to their ionizing power, and in proportion to their energy content on the small seeds used in the experiments except when the embryo was protected by being turned away from the radium. The retardative effect relative to the duration of exposure increased with the lengthening of the exposure, then decreased, and finally became constant with a slow increase of retardation. Very short irradiation in the case of mustard and millet seed left doubt as to whether acceleration occurred or not. By comparing the retardation of mustard and millet when the embryo was turned toward and away from the radium it was found that this part of the seed was especially sensitive to the electrons.

Dry matter, nitrogen, and mineral content of trees during the vegetative period, E. RAMANN and H. BAUER (*Jahrb. Wiss. Bot. [Pringsheim], 50 (1911), No. 1, pp. 67–83; abs. in Bot. Centbl., 119 (1912), No. 20, pp. 491, 492*).—Investigations with young trees of various common species led to the following conclusions:

The new growth of foliage trees in the spring takes place chiefly by the expenditure of materials previously stored, which are often broken down and utilized in large quantities in such trees. Conifers utilize in addition newly assimilated materials, different species drawing on the soil supply during different periods. For example, nitrogen assimilation by fir trees takes place most actively during the period from September until about May 15; by pine trees from that time until July 15; and by Scotch fir and larch trees thereafter until September 15. The relations of the phosphorus compounds are about the same. These facts suggest the cultivation of a mixed stand for the best utilization of the abundant materials in a rich soil. See also previous notes (E. S. R., 25, p. 27; 27, p. 229).

The mineral content of tree foliage as affected by day and night, E. RAMANN (*Jahrb. Wiss. Bot. [Pringsheim], 50 (1911), No. 1, pp. 84–91; abs. in Bot. Centbl., 119 (1912), No. 20, p. 491*).—Analyses made, in pursuance of previous studies (see above), of leaves of beech, oak, hazel, plane tree, maple, etc., indicate that while other minerals do not show any considerable difference for day and night, the calcium content (as computed on the basis of the dry substance) increases at night and decreases by day. A possible connection is suggested between the relative quantity of this mineral present and the trans-

portation or assimilation products, which is said to be more active during the hours of daylight.

Changes in the osmotic pressure of the sap of the leaves of various plants, H. H. Dixon and W. R. G. Atkins (*Sci. Proc. Roy. Dublin Soc., n. ser., 13 (1912), Nos. 16, pp. 219–222; 18, pp. 229–238, figs. 2; 19, pp. 239–246, fig. 1*).—Investigations have been made on the changes in the osmotic pressure of the sap of the leaves, the method employed being that described elsewhere (E. S. R., 23, p. 526).

Experiments with *Syringa vulgaris* were carried on to trace the changes in the osmotic pressure during the unfolding of the buds and the maturing of the leaves. It was found that the osmotic pressure of the sap of the buds rose from February to March, and this is attributed to the transportation of dissolved substances into the buds and to the solution of previously undissolved bodies in them. In April the rapid increase in size of the leaves was associated with a dilution of the sap, indicating that during this period the absorption of water predominated over the accumulation of dissolved substances. From that time on, as the leaves grew and matured, the pressure continued to rise until June, when the observations were brought to a close. Previous observations, however, indicate that the pressure continues to rise in the leaves during the summer. After the final rise of osmotic pressure in the late summer a diminution is registered in the sap from the leaves just about to fall. This is attributed to the transportation of materials from the leaves.

In the second and third papers the materials selected for investigation were the leaves of evergreen plants. In *Ilex aquifolium* there was not only a difference observable between the mature and immature leaves in their osmotic pressure, but also between mature leaves of various ages.

With *Hedera helix* the effect of direct sunlight on osmotic pressure was investigated, and with this plant it was also found that the age of the leaves had a marked influence on the concentration of the cell sap. Leaves of the ivy which were grown in a southern aspect had a consistently higher cryoscopic value than those of leaves grown in a northern aspect. This confirms other observations which showed that the depression of freezing point of the sap of the aerial portions of plants was greater in plants grown in a sunny position than in those grown in more shaded situations. In Hedera as in Ilex the depressions in the curve seemed to correspond to periods of elongation of the shoots and the formation of new leaves, and it was found impossible to correlate the form of the curves closely with external conditions. The effect of photosynthesis on variation in osmotic pressure was investigated, and the results indicate that photosynthesis is active in raising the concentration.

The formation of mechanical tissue as influenced by tension and contact, W. D. Brush (*Bot. Gaz., 53 (1912), No. 6, pp. 453–477, figs. 3*).—Studies are reported on the formation of mechanical tissue in the tendrils of *Passiflora cærulea* as influenced by tension and contact. The experiments were conducted in the greenhouse under control conditions and the results are given in detail.

It was found that the tendrils which function to support the plant possess a greater breaking strength than those which have grasped no support. The cause of this greatly increased strength is attributed to a combination of the two factors contact and tension. Comparing the values of these two factors, the author concludes that contact plays the more important part, though the strength of the tendril may be still more increased by the factor of tension. The author claims that tension may also act as a stimulus and thereby result in the production of stronger tissues in the plant. It is thought probable that this increased growth is due to increased hydrostatic pressure.

A bibliography is appended.

The admission of anilin colors into living plant cells. E. Küster (*Jahrb. Wiss. Bot. [Pringsheim]*, *50 (1911)*, *No. 3, pp. 261–288; abs. in Bot. Centbl., 119 (1912)*, *No. 20, pp. 588, 589; Ztschr. Bot., 4 (1912)*, *No. 6, p. 561*).—The author reports as the results of his experiments that various anilin solutions are taken up by living parenchyma cells near the vascular bundles and stored and strongly held by such cells, this being conspicuously true in case of epidermal cells of leaves and flowers. The cells in question exhibited a selective power when provided with different colored solutions. The coloring matter once admitted is not washed out if immersed for some time in standing or running water. Thus, several acid coloring matters have now a claim to be considered as vitally colorative, a character heretofore generally considered to be limited to basic colors. Only a very few colloidal substances are found to possess this ability. Transpiration favors greatly the entrance of coloring matters into the cells.

The significance of respiration pigments in the oxidation processes of plants, W. Palladin (*Ztschr. Gärungsphysiol., 1 (1912)*, *No. 2, pp. 91–105*).—Continuing previous work (E. S. R., 27, p. 426), the author gives the final results of his studies on the relation of respiration pigments to oxidation processes, in substance as follows:

The rôle of these pigments in the oxidation processes consists in the withdrawal of hydrogen from the oxidizing substance. The oxidases appears as ferments, building both water and pigment. During respiration the entire hydrogen of the glucose, which is anaerobically broken up, is oxidized to water. The oxidation of glucose by the aid of a respiratory pigment occurs with the participation of water. Such oxidation occurs partly by use of the oxygen in the glucose, partly by employment of that in the water assimilated, water being both produced and assimilated during this process. The respiration pigments are held to be necessary to the intracellular respiration and to the oxidation of the hydrogen. The chemical reactions held to support these statements are given in some detail.

Distribution of pigment in the seed coat of the cowpea, A. Mann (*Abs. in Science, n. ser., 35 (1912)*, *No. 913, p. 1004*).—A study of the seed coat of the cowpea showed that it is composed of 3 principal layers of cells, an outer palisade layer, a heavy-walled layer of empty cells below this, and a layer of considerably compressed cells with a long axis parallel to the surface of the cowpea.

It was found that the colorations in the cowpea are the result of pigments deposited in 2 of these layers. In all colored cowpeas there is in the lowest layer a basal color or practically uniform tint, which is a melanin compound of an orange-yellow tint, grading into lemon yellow and pale buff. All the other colors are obtained by superposing upon this basal color layer various pigments, and these are uniformly deposited in the palisade cells. The 3 colors found in the palisade cells are black or blue-black, sometimes purple, which is an anthocyanin, a yellow or a brown pigment, and an intensely black pigment, the last 2 being melanin compounds. By various arrangements of these superposed tints, or by the absence of any pigments in these cells, the various schemes of coloration in the cowpea are obtained.

In the case of cowpeas having white or colorless seed coats, the result, it is stated, is obtained by the suppression of all pigments, both in the basal color layer and in the palisade color layer.

A wild cowpea secured from Africa showed the same elements of color as well as the schemes of coloration.

The distribution of oxidases in plants and their rôle in the formation of pigments, F. Keeble and E. F. Armstrong (*Proc. Roy. Soc. [London], Ser. B,*

85 (1912), No. B 578, pp. 214–218).—Studies were made of the distribution of oxidases in connection with the formation of pigments in the Chinese primrose (*Primula sinensis*).

The distribution of pigment in the flower was found to coincide with that of peroxidases, two of which were found in the primrose, one occurring in the epidermis and in some cases in the layers subjacent to the epidermis, while the other was localized in layers of cells neighboring the woody tissues of the vascular bundles. The epidermal and bundle peroxidases were found to differ from one another both in their distribution and in their color reactions. Certain varieties of the Chinese primrose give under certain circumstances a direct oxidase reaction. The bundle peroxidase of the petals of the flower is located in the cells of the bundle sheath which surrounds the veins.

White flowers which are known to be dominant whites are said to fail to give the epidermal peroxidase reaction, but in such flowers a faint bundle peroxidase reaction may occur. Both epidermal and bundle peroxidases are, however, present in dominant white flowers, the white primulas containing a substance which inhibits but does not destroy the pigment-producing peroxidase.

Observations made on the epidermal and bundle peroxidases are believed to throw light on the significance of sporting in cultivated flowers, the authors being inclined to regard flaking as the effect of the bundle peroxidase on the chromogen-containing cells neighboring on the bundle sheath. The white color is attributed to an inhibitor associated with and nullifying the epidermal peroxidase. The marked localization of pigmentation effected by bundle peroxidase appears to be due to anatomical causes, such as the degree of development of the cells and the nearness of the veins to one another.

The existence of two localized peroxidases which may induce pigmentation and may reenforce one another along certain tracts of tissue is held to provide material facts for the explanation of color range and color pattern in flowers.

The occurrence of urease in higher plants, G. Zemplén (*Hoppe-Seyler's Ztschr. Physiol. Chem., 79 (1912), No. 3, pp. 229–234; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 597, II, p. 674*).—In a series of investigations to ascertain the presence and proportion of urease in certain agricultural plants, the author found it in a large number of the Papilionaceæ, different species of which contain this enzym in widely varying percentages, while in the Gramineæ it was present, if at all, in quantities scarcely demonstrable in most cases. Tabulated details are given and an early discussion is promised.

The action of bisulphid of carbon on the germination of seeds, B. Finzi (*Staz. Sper. Agr. Ital., 44 (1911), No. 11–12, pp. 843–848*).—A preliminary note by the author on his experiments shows that exposure to carbon bisulphid vapor during periods varying from 30 minutes to 48 hours accelerated the germination of seeds of *Ægilops cylindrica*, *Bromus erectus*, *Trigonella fœnum græcum*, *Panicum miliaceum*, *Canna cupheana*, and *C. orientalis*. The seeds of 8 other species either showed little or no acceleration or appeared to be retarded.

Nutritive changes in sprouting pumpkin seeds, F. T. Periturin (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscou), 18 (1912), No. 2, pp. 228–256*).—The pumpkin seeds experimented upon were divided into 4 lots and sprouted in water and in solutions of ammonium chlorid, ammonium chlorid with calcium carbonate, and ammonium chlorid with calcium sulphate. After 10 days the seedlings were analyzed and the fat and nitrogen contents ascertained. The results are given in tabular form. It appears therefrom that etiolated seedlings take up ammonia not as such but as asparagin, the larger results being obtained when the calcium salts were employed with ammonium salt in the nutritive solutions.

The formation of asparagin in sprouting vetches, G. I. RITMAN (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscou), 18 (1912), No. 2, pp. 213–220*).—From studies of young seedlings of *Vicia sativa*, nourished with ammonia and nitrates, the author concludes that almost all the nitrogen assimilated by the roots in darkness goes into the formation of asparagin.

Protein formation by sterile cultures of higher plants in darkness, I. SHULOV (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 13 (1912), No. 2, 207–210*).—Investigations carried out with sterile cultures of maize in darkness, supplied with a prepared carbohydrate (saccharose), are said to have shown the following results: Assimilation of the nitrogen-free organic material, the depressing effect of ammonium sulphate on plant development, the decrease of such unfavorable influence by employment of ammonium nitrate, a considerable increase of proteins, and confirmation of the practicability and reliability of the methods here employed.

The utilization of ammoniacal nitrogen by corn plantlets, S. I. KALINKIN (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscou), 18 (1912), No. 1, pp. 180–192*).—The author experimented with 4 different lots of young maize plants kept in darkness for 10 days and supplied, respectively, with (1) water, (2) a 0.075 per cent solution of ammonium chlorid, (3) the same percentage of the chlorid plus calcium carbonate, and (4) of the chlorid with calcium sulphate.

The results showed that the nitrogen of the ammoniacal salt is utilized by the plant in the construction of protein, either directly or through the formation of asparagin. The results, in general, agree with those obtained by Prianishnikov and Shulov with peas (E. S. R., 24, p. 629), Godlewski with grains (E. S. R., 26, p. 625), and of Ritman with vetches and Periturin with pumpkin seeds, noted above.

Further experiments on the utilization of ammonium salts by green plants, E. PANTANELLI and G. SEVERINI (*Staz. Sper. Agr. Ital., 44 (1911), No. 11–12, pp. 873–908*).—Continuing previous work (E. S. R., 25, p. 223), the authors find that ammoniacal nitrogen has a potential nutritive value for plants superior to that of nitrates, but the full expression of that higher value is conditioned upon (1) slow absorption of the ammonium cation by the roots, (2) about equal absorption of the corresponding anion, and (3) the possession of a nutritive value by the anion itself.

The presence of nitrifying bacteria in ordinary sand cultures, I. SHULOV (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 13 (1912), No. 2, pp. 211–215*).—By introducing into the substratum for nitrifying bacteria sand from ordinary cultures, the author was able to show that these bacteria may be present in such cultures and that the process of nitrification may occur therein. Notable losses of ammonia gas were observed by this investigator, as previously by H. Astafjew, and attributed to the action of magnesium carbonate on ammonium sulphate.

On the presence of glutamic acid in the tomato, N. MONTI (*Staz. Sper. Agr. Ital., 44 (1911), No. 11–12, pp. 813–823*).—The author claims to have demonstrated the presence of this acid in the sap of tomatoes, but has been unable to determine its origin.

On anthocyanin-forming bodies, J. POLITIS (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 20 (1911), I, No. 11, pp. 828–834; abs. in Bot. Centbl., 119 (1912), No. 21, p. 524*).—After a brief discussion of the mechanism of anthocyanin formation, the author gives an account of his investigations with flowers of *Billbergia nutans*, *Iris fimbriata*, *Lalia anceps*, *Aquilegia glandulosa*, *Erica carnea*, *Nepeta glechoma*, *Clerodendron balfouri*, *Weigela japonica*, *W. rosea*, and on fruits of *Convallaria japonica*.

It is concluded that anthocyanin is not formed from substances in the cell sap, but is the product of special organs termed cyanoplastids. These originate from the protoplasm as a new product, being made up largely of tannin-like substance inclosed in an envelope of unknown chemical composition, both envelope and contents, however, being able to become sources of anthocyanin. Certain external agencies seem able to hinder or prevent a transformation of the cyanoplastid material into anthocyanin, this body remaining colorless. Each cyanoplastid seems to pass through a determinate cycle of development. When degeneration begins, the pigment formed therein is given up to the cell sap. Different kinds of anthocyanin are found, giving various colors, which do not depend upon the acidity of the cell sap to color a given pigment differently.

On the presence of free hydrocyanic acid in plants, II, C. RAVENNA and V. BABINI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 21 (1912), I, No. 8, pp. 540–544*).—By methods previously described (E. S. R., 24, p. 229), the authors have made a study of the leaves of cherry laurel, peach, sorghum, flax, and medlar, and have found that free hydrocyanic acid occurs in appreciable quantity in all of them.

The selective power of plants for dextrose and levulose, L. LINDET (*Ann. Inst. Nat. Agron., 2. ser., 10 (1911), No. 1, pp. 49–68; abs. in Bot. Centbl., 119 (1912), No. 20, pp. 489, 490*).—This article has been previously noted from other sources (E. S. R., 25, p. 522).

Potassium in relation to carbohydrate formation and decomposition, J. STOKLASA (*Ztschr. Landw. Versuchsw. Österr., 15 (1912), No. 6, pp. 711–736*).—In pursuance of previous studies, noted elsewhere (E. S. R., 25, p. 522; 26, p. 225), on the physiological influences of certain metals, the author experimented with the action of potassium on cells of several plants. He concluded that potassium is generally indispensable to the building of carbohydrates, as well as for their physiological combustion, also in the metabolic processes occurring both in cells which lack and those which possess chlorophyll.

The action of sulphurous acid on pollen, V. SABACHNIKOFF (*Compt. Rend. Soc. Biol. [Paris], 72 (1912), No. 5, pp. 191–193; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 4, pp. 1049, 1050*).—The author reports that in an atmosphere saturated with sulphurous acid, pollen of the following plants was killed by an exposure of from 3 to 5 minutes: *Helleborus viridis, H. orientalis, Hepatica triloba* (*Anemone hepatica*), *Galanthus nivalis, Primula officinalis, Vinca minor, V. major, Convallaria majalis, Narcissus pœticus, Caltha palustris, Cytisus laburnum, Viola tricolor, Orchis maculata,* Billbergia, Eranthis, and Crocus.

Very small proportions of sulphurous acid (between 1:1,000 and 1:30,000 with exposures from 3 to 48 hours) do not as a rule kill the pollen or destroy its germinating power, but the pollen tube grows abnormally, usually remaining short, and taking an irregular form. This is said to have been noted in the case of *A. hepatica,* Billbergia, *H. orientalis, Vinca minor, Viola tricolor, P. officinalis, Lilium candidum,* Petunia, and Pisum. The germinating property of pollen remained unimpaired after exposure of from 1 to 48 hours to sulphurous acid with a concentration of 1:48,000, but this property was usually destroyed by a 3-hours' exposure to the concentration of 1:13,000, which conditions of exposure may be considered as about the limits of safety for these pollens.

Injury to plants by vapors and dust from tarred roads, C. L. GATIN (*Ztschr. Pflanzenkrank., 22 (1912), No. 4, pp. 193–204*).—This is a further account of the author's investigations (E. S. R., 27, p. 333), stating that both laboratory and garden studies support the conclusions that coal tar and its products carried by air and dust to foliage are injurious to the plants; that such

injury does not always become apparent at first, in some cases not within 2 years; and that sunlight favors the injurious action of the tar products in certain cases.

A bibliography is appended.

A study on the influence of starvation of the ascendants upon the characteristics of the descendants, I, J. A. HARRIS (*Amer. Nat., 46 (1912), No. 546, pp. 313–343, dgms. 7*).—The author presents his first report on a study of 5 series of garden beans, giving a statement of the problem and a description of the methods, the work having been carried on for some time and involving about 21,000 individuals.

The purpose of the investigation was to ascertain whether the artificial depauperization of the ancestors has any influence upon the characters of the offspring. Beans were planted in ordinary fertile and sterile soils or good and poor agricultural land, and the influence of from one to three generations was studied. Thus far, it is stated, hardly any difference can be detected by the eye in the field, but the statistical constants seem to show a slight influence of the treatment of the ancestors in the form of a slight decrease in the number of pods per plant.

The data are as yet insufficient to justify any discussion of the question of the cumulative influence of the starvation conditions or of the mechanism through which the characters of the plants are modified.

Chromosome numbers in Triticum and Ægilops, W. BALLY (*Ber. Deut. Bot. Gesell., 30 (1912), No. 4, pp. 163–172, pl. 1*).—This is a cytological contribution to the study of relation among the wheats, based upon a study of the chromosome numbers. It is stated that (1) *Triticum dicoccoides* has 8 simple chromosomes, in this respect resembling *T. vulgare* and *Secale cereale*, and (2) *Ægilops ovata*, which is able to hybridize with species of Triticum, has 16 simple chromosomes.

A bibliography is appended.

Soil moisture in the cottonwood dune association of Lake Michigan, G. D. FULLER (*Bot. Gaz., 53 (1912), No. 6, pp. 512–514, fig. 1*).—The author records data regarding the range of soil moisture in the cottonwood dune association upon the shores of Lake Michigan. This area is considered an open association of a single tree species, together with a scanty undergrowth of shrubs and grasses, developing upon more or less rapidly moving dunes, possessing a high rate of evaporation and exhibiting many strongly xerophytic characters. The almost complete absence of herbaceous undergrowth and the expanse of bare sand give it a desert-like aspect, but below the superficial layer of sand an abundant and unfailing water supply has been found.

The wilting coefficient of the dune soil was determined by the method of Briggs and Shantz (E. S. R., 26, p. 628) to be 0.75 per cent. Throughout the most arid portion of the season the surplus of growth water was found to average 2.2 per cent, showing that, considered upon the basis of its soil moisture, the association is decidedly mesophytic. The causes of the xerophytic character of the vegetation are believed to be the high evaporating power of the air and the instability of the substratum.

From the data obtained the author believes that the determination of soil moisture, related to plant growth through the wilting coefficients of the soil, will afford an efficient means of making quantitative studies of the water supplies of the subterranean parts of plant associations, and enable students of ecology to analyze more closely the effects of various factors influencing the production of any particular plant association.

A comparison of the rates of evaporation in certain associations in central Illinois, H. A. GLEASON and F. C. GATES (*Bot. Gaz., 53 (1912), No. 6, pp. 478–*

491, figs. 6).—An account is given of a series of measurements of the relative rates of evaporation in certain plant associations made during June and July, 1910. The authors used porous clay atmometers for determining the differences in evaporation, and it was found that the differences in the various associations are due chiefly to the nature of the vegetation, which by its size and density controls the evaporation beneath it. It is claimed that successions between associations are not caused by any conditions of evaporation, and that the more primitive associations have the higher rates of evaporation, while those most nearly like the climax type have the lowest rates. This is held to be true not only for forest associations but also for prairie associations, which are correlated with an arid climate and consequently high climatic evaporation.

Seeds and plants imported during the period from July 1 to September 30, 1911—Inventory No. 28 (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 248, pp. 71*).—This gives a list with descriptive notes of seeds and plants imported during the period mentioned, more than 500 items being included. A large portion of the material was obtained by Mr. F. N. Meyer in Chinese Turkestan, and the balance from miscellaneous sources.

FIELD CROPS.

Results obtained in 1911 on the Dominion experimental farms from trial plats of grain, fodder corn, field roots, and potatoes, C. E. SAUNDERS (*Canada Cent. Expt. Farm Bul. 71, 1911, pp. 74*).—Results of a large number of experiments conducted at the experimental farms during the season of 1911 with important varieties of wheat, oats, barley, peas, corn, turnips, mangels, carrots, sugar beets, and potatoes are presented. The results show marked differences in earliness and in the relative productiveness of varieties even when grown under similar conditions. Lists of recommended varieties of the different crops suitable for the different provinces or districts are given. The publication of data as to the average yields obtained during a series of years, as noted in previous bulletins (E. S. R., 24, p. 435), has been discontinued.

Second report on experiments, botanical experiment station, Salisbury, 1910–11, J. H. HAMPTON (*Rhodesia Agr. Jour., 8 (1911), No. 6, pp. 853–862; 9 (1911), No. 1, pp. 16–23, pls. 4*).—Moderately satisfactory results were obtained with dry-land alfalfa. Egyptian clover, velvet beans, cowpeas, lupines, ground nuts, sweet potatoes, wheat, oats, Teff grass (*Eragrostis abyssinica*), teosinte, sugar cane, and various millets were tested for summer forage. Velvet beans yielded 3,680 lbs. of cured hay per acre and proved more satisfactory than cowpeas. Only the Black-eyed Susan and Iron cowpeas gave satisfactory results. American peanuts and sweet potatoes proved superior to the native varieties. Other crops discussed are flax, mangels, sugar beets, swedes, kohlrabi, carrots, rape, beans, and peas.

Annual report of the experimental work of the Bankipore Agricultural Station, 1910–11 (*Ann. Rpt. Bankipore Agr. Sta. [Bengal], 1910–11, pp. 10*).—Two rice seedlings per hole gave greater yields of grain and straw than plantings of 1, 4, or 8 seedlings per hole. Green manuring with sann hemp was followed by somewhat greater yields of rice and straw than green manuring with dhaincha, and both by much greater yields than from the unmanured plats. Other work reported includes variety and fertilizer tests with rice and a fertilizer test with sugar cane.

Annual report of the Cuttack Experimental Farm, 1910–11, A. C. DOBBS (*Ann. Rpt. Cuttack Agr. Sta. [Bengal], 1910–11, pp. 11*).—Transplanting rice at the rate of 1 seedling per hole gave a greater 5 years' average yield than transplanting at the rate of 2, 3, or 4 seedlings. Other work reported includes

variety, fertilizer, rate of seeding, and irrigation tests with rice, a comparison of broadcasting and transplanting rice, and a fertilizer test with sugar cane.

Annual report of the agricultural stations in Eastern Bengal and Assam for the year ending June 30, 1911 (*Ann. Rpt. Agr. Stas. East. Bengal and Assam, 1911, pp. II+99, pls. 3*).—Previous work has already been noted (E. S. R., 26, p. 233).

Work with rice, sugar cane, cotton, soy beans, and fodder crops is reported for the Dacca station, with tobacco, oats, mustard, wheat, potatoes, peanuts, green manure, and fodder crops at the Burirhat station, with rice and sugar cane at the Rajshahi station, with sugar cane, peanuts, potatoes, and the application of lime at the Jorhat station, with fruit and garden crops at the Shillong fruit station, and with potatoes, oats, flax, soy beans, ensilage, and fodder at the Upper Shillong station. A brief progress report of work at the Wahjain station is also given.

At the Jorhat station the Striped Mauritius sugar cane stood first in total yield of sugar, followed by B 376 and B 147. These 3 varieties were also superior to the others in quality of juice. At the Upper Shillong station it proved better to plant whole potatoes than to cut them in case of what the author terms summer seed, but the cut sets produced the highest yields in case of winter seed.

Annual report of the demonstration farm, St. Andrew's Colonial Homes, Kalimpong, for the year 1910–11, P. W. Goodwin (*Ann. Rpt. Kalimpong Demon. Farm, Bengal, 1910–11, pp. II+40*).—A report of fertilizer, variety, and other tests of corn, rice, jute, buckwheat, barley, spelt, oats, soy beans, and other crops.

Field crops at the Taganrog Experiment Field during 1899–1908, N. Olenin (*Khoziaistvo, 1911, No. 6–7; abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. (Landw.), 12 (1911), No. 4, pp. 572, 573*).—This is an account of the first 10 years' work on these fields. Early green fallow appeared preferable to all other kinds. Fall plowing 5¼ in. deep gave better results than either more shallow or deeper plowing, but in the spring 3½ in. appeared to be the best depth.

Moor culture handbook, W. Bersch (*Handbuch der Moorkultur. Vienna and Leipsic, 1909, pp. XII+288, pls. 8, figs. 41*).—This manual of information is divided into 10 chapters, dealing with the historical, scientific, soil, cultural, forestry, weed control, and economic phases of the subject.

Manuring of meadow land (*Rpt. Dir. Agr. Ed., Monmouthshire Ed. Com., 1911, Oct. 18; abs. in Jour. Bd. Agr. [London], 18 (1912), No. 11, p. 941*).—This is a report of fertilizer tests on 3 different soils since 1909.

Manuring of poor hill pastures (*Rpt. Agr. Instr. Com. Somerset. County Council, 1911; abs. in Jour. Bd. Agr. [London], 18 (1912), No. 11, p. 941*).—This is a report of tests of basic slag, superphosphate, lime, and kainit at 4 points in Somerset. Slag and superphosphate apparently produced a marked improvement, but little or no result followed the use of ground lime or of kainit.

The grain crops, J. F. Hoffmann (*Das Getreidekorn. Berlin, 1912, vol. 1, pp. VII+249, figs. 77*).—In the 5 parts into which this work is divided, the author considers the general and botanical characters of the grain crops, with special reference to their production and diseases. Fungus and insect enemies and the insects injurious to stored grains are also treated. In the chapter dealing with the botanical and cultural phases of the subject, separate discussions deal with rye, wheat, barley, oats, rice, corn, beans, and buckwheat.

Rate of sowing summer cereals, A. Danilenko (*Iugo Vost. Khoz. 1910, No. 42; abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 12 (1911), No. 4, pp. 581, 582*).—This article reports the results of tests of rates of sowing swedes, oats, and barley in rows at the Don Experiment Field.

Grain sowing in wide rows, A. DANILENKO (*Iugo Vost. Khoz. 1910, No. 42; abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 12 (1911), No. 4, p. 581*).—In 1910 at the Don Experiment Field the usual continuous sowing in rows was compared with sowing in single and double rows 14 in. or less apart with wheat, oats, barley, and millet. Sowing in wide rows apparently decreased the yield of wheat, but increased the yields of oats, millet, and barley, except in the case of the double rows, to an extent sufficient to make sowing in wide rows profitable.

The composition of Cape barley, C. F. JURITZ (*Agr. Jour. Union So. Africa, 3 (1912), No. 4, pp. 516–529*).—Tables report analyses of 47 samples of barley, and the location, character, cultural treatment, and fertilization of the soil upon which each was grown.

The dissemination of brewing barley in Germany, H. SCHULZE (*Wchnschr. Brau., 28 (1911), Nos. 32, pp. 350–356; 33, pp. 367–371; 34, pp. 382–385; 35, pp. 397–400, fig. 1*).—This article presents the information obtained in an investigation of the present geographical distribution of brewing barley varieties in Germany, and suggests varieties that are likely to come into general use in certain sections.

Bogoroditsch Experiment Field, I. A. PULMAN (*Ezheg. Dept. Zeml. [Russia], 1909, pp. 51–77, pls. 10; abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 12 (1911), No. 4, pp. 582–584*).—Meteorological data and descriptions of the soils of the Bogoroditsch Experiment Field in Staros-Kalsk County in the Kursk government accompany a statement of the results of 8 years' experimental work dealing largely with buckwheat. The observations reported deal with the effect of rate of planting, soil moisture, and the amount and distribution of sunshine during the season on the structure and development of the buckwheat plant. Work is also being done on the production of a 4-faced strain or variety which is more resistant to early spring frosts and produces heavier seeds.

The manuring of carrots, E. E. STOKES (*Midland Agr. and Dairy Col. B. J. 4, 1911–12, pp. 39–44*).—The author concludes that the soil usually planted to carrots should receive salt, especially during a hot, dry season, that potash in some form is absolutely necessary, and that phosphates stand next in order of importance.

Manurial experiments on maize, H. J. VIPOND (*Agr. Jour. Union So. Africa, 2 (1911), No. 5, pp. 618–623*).—In a test of 13 applications of lime, phosphate, slag, bone meal, sulphate of potash, and nitrate of soda, singly or in various mixtures and amounts, the highest corn yields followed the use of 400 lbs. of bone meal and 400 lbs. of basic slag. Analyses of 20 Transvaal soils are given.

Corn growing in the East, T. F. HUNT (*Pennsylvania Sta. Bul. 116, pp. 16, figs. 5*).—After a study of the acreage devoted to each of a number of crops in the North Atlantic States, the author concludes "that the composite eastern farmer has a 7 years' rotation in which an intertilled crop, a spring grain, and a winter grain each occupy 1 year, while hay occupies 4 years." Based on results secured by the station and previously noted (E. S. R., 3, p. 713; 26, p. 167), the following rotations are suggested: (1) Corn, wheat, clover and timothy; (2) corn, oats, wheat, clover and timothy; (3) corn, oats, wheat, clover and timothy, timothy; and (4) 2 years in corn, one each in oats, wheat, and clover and timothy, and 2 in timothy.

Portions of letters from experiment-station workers in the North Atlantic States are reprinted and photographs illustrate sample ears submitted in response to a request for samples of varieties worthy of special mention. In nearly every instance 2 types were recommended, an 8-rowed flint, and a

medium-sized dent to which the name Pride of the North was usually given. The only exceptions to this rule were the southern portions of New Jersey and Pennsylvania, and the more northern portions of the New England States.

How to grow one hundred bushels of corn per acre on worn soils, W. C. SMITH (*Cincinnati, 1912, 2. ed., rev. and enl., pp. 188, pls. 24*).—This handbook of information for corn growers is written with special reference to the restoration of worn-out soil for corn production.

Observations on certain extra Indian Asiatic cottons, H. M. LEAKE and R. PERSHAD (*Mem. Dept. Agr. India, Bot. Ser., 4 (1912), No. 5, pp. 93–114, pls. 7*).—Botanical and other information on the cottons of Persia, China, and Siam.

The branching habits of Egyptian cotton, A. MCLACHLAN (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 249, pp. 28, pls. 3, fig. 1*).—This bulletin presents results of a study of the branching habits of Egyptian cotton conducted for the purpose of developing a system of cultivation adapted to the irrigated districts of southern California and Arizona. By means of especially devised diagrams for recording the branching habits of the plant, the location of branches, the development of fruiting branches, and the stature of plants are illustrated.

It is pointed out that the Egypian cotton plant bears 2 kinds of branches, long vegetative branches on the lower part of the stem bearing no flower buds directly, and above these shorter fruiting branches, which bear flower buds. The vegetative branches usually approximate the length of the main stem, bear no flower buds except as they produce secondary fruiting branches, and, like the axis, bear fruiting branches and may bear vegetative branches. The fruiting branches, on the other hand, are about only one-third as long as the vegetative branches, bear a flower bud at each node opposite the leaf, and rarely bear fruiting branches or vegetative branches. It is stated that from 6 to 8 large vegetative branches are usually produced from the first 10 nodes of the axis, and that at the next 2 or 3 nodes the buds frequently remain dormant or are abortive, while above these a fruiting branch is produced at each node.

The length and number of vegetative branches largely determine the stature of the plant, and their control is necessary because of the desirability of small plants in cultivating and harvesting. As a means of restricting the development of branches early planting is advised.

Abortion of early fruiting branches on both axis and large limbs was common in a greater or less degree to all stocks grown from imported seed. It has been found that the Arizona acclimatized plants frequently abort their lowest fruiting branches. Some of the selected acclimatized types of Egyptian cotton, originated in the United States, bear fruiting branches at lower nodes on the stem than the imported stocks. Of the 6 Egyptian varieties grown in Arizona in 1909 from imported seed, Nubari most nearly resembled the acclimatized stocks in putting out fruiting branches at comparatively low nodes. Topping young plants resulted in stimulating the growth of buds in the axils of cotyledons. Branches just below the point where the plant was topped make an excessive vegetative growth and tend to assume an upright position in place of the severed axis. Egyptian cotton plants grown on soil containing considerable alkali restrict the development of limbs and reject their early fruiting branches.

Cotton improvement under weevil conditions, O. F. COOK (*U. S. Dept. Agr., Farmers' Bul. 501, pp. 22*).—This publication discusses various factors in their bearing upon the profitable and progressive culture of cotton under weevil conditions, special attention being given to earliness in the variety and cultural methods. It is pointed out that "the general object of all measures of controlling or resisting the boll weevil is to shorten the period . . . between the formation of flower buds and the growth of the bolls beyond the danger of weevil

injury. . . . While earliness becomes a more important factor than before there is nothing to indicate that superior varieties are likely to be excluded from cultivation in any section that continues to grow cotton in the presence of weevils. . . . Many advantages can be gained if the cotton growers of each community would unite in the choice of a variety and the date of planting and would follow the same methods of cultivation, selection, ginning, and marketing the crop."

The influence of Russian weather conditions in 1902 on oats, K. Mikhaĭlovskiĭ (*Trudy Selsk. Khoz. Met., 1910, No. 6, pp. 1–20; abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 12 (1911), No. 6, pp. 925, 926*).—After drought and excessive heat, 35 per cent of the oat heads were imperfectly developed or contained no seed. When stalks appeared 11.7 per cent of them were destroyed, and lightness of grain at harvest time reduced the yield by from 13 to 20 per cent. The total loss arising from meteorological conditions is estimated at 59.7 per cent of the crop. The data obtained are more fully stated in tables and charts.

Wild oats and false wild oats: Their nature and distinctive characters, N. Criddle (*Canada Dept. Agr., Seed Branch Bul. 8–7, 1912, pp. 11, pls. 4*).—Examples of the Banner, Newmarket of Abundance, Old Island Black, and Storm King types of false wild oats (also called sports, white wild oats, and albino wild oats) have been grown for from 2 to 7 years without change in appearance. A black oat of unknown name also grew true to type for 2 years. The author does not regard false wild oats as dangerous or think it likely that they result from crosses of wild and cultivated species.

Annual report of the Dumraon Agricultural Experiment Station, 1910–11, A. C. Dobbs (*Ann. Rpt. Dumraon Expt. Sta. [Bengal], 1910–11, pp. 5*).—This is a report of fertilizer, variety, and drainage tests of rice.

The "Ráb" system of rice cultivation in western India, H. H. Mann, N. V. Joshi, and N. V. Kanitkar (*Mem. Dept. Agr. India, Chem. Ser., 2 (1912), No. 3, pp. 141–193*).—A brief account of earlier experiments on the value of the "Ráb" system (E. S. R., 23, p. 129) is followed by a full discussion and numerous tables presenting the data obtained in the authors' experiments, from which the following conclusions are drawn:

The benefits from this system vary widely but "normally the weight of the seedlings obtained is from one and a half times to twice as great as without the treatment." Nearly 60 per cent of this increase results from heating, the remainder being due to the ash and other materials added. During ordinary burning with cow dung the temperature does not rise above 110° C. at a depth of ½ in. and 85° at a depth of 1 in., and the heating process lasts from 1½ to 2 hours or less.

Only very slight results were obtained by heating the soil to 75°. At higher temperatures the fertility was greatly increased, reaching a maximum at about 125°. The maximum effect resulted from heating immediately before the sowing of the crop. A little less effect resulted from heating 6 weeks before sowing, while comparatively little effect resulted from heating 3 months before sowing.

The supply of assimilable mineral plant food and of soluble organic matter in the soil was considerably increased by heating, but little effect was produced when growing rice plants were treated with extracts of such heated soils. The speed of germination was not beneficially affected but was apparently slightly retarded at times. This did not appear to be due to the production of a deleterious substance.

Heating materially changed the physical condition of the soil by bringing a large part of the viscous, sticky clay substance into such condition that it

would not remain in suspension in water. This effect was temporary, disappearing after 3 months, and the mere keeping of air-dry soil for 6 weeks materially reduced it. This power to precipitate soil is shared by oil cake (safflower cake) but not by any other cakes tested. This change in the physical condition of the soil is only a secondary cause of the beneficial effect of the "Ráb" process.

The heating destroyed a large proportion of the active aerobic life of the soil, but even when the soil was kept in an air-dry condition this aerobic activity became far greater in 6 weeks than in the unheated sample, though this difference disappeared on further keeping of the soil. Soil fertility is not considered dependent on the presence of aerobic soil organisms during plant growth, but on the contrary "the fertility of a heated soil is greatest when the aerobic organisms present are fewest."

The author suggests as a more economical method of obtaining the benefits of this method that soil be burnt in heaps, as this would require less fuel and work.

The mutual relations of weight and sugar content in Beta vulgaris saccharifera, K. ANDRLÍK, V. BARTOŠ, and J. URBAN (*Ztschr. Zuckerindus. Böhmen, 36 (1912), No. 4, pp. 193–210, figs. 4; abs. in Bot. Centbl., 119 (1912), No. 21, p. 541*).—Determinations on a large number of sugar beets are said to have shown that the weight of these roots is more readily modified than is the sugar content. The experiments did not tend to support the statement that the greater the weight the less the sugar content, except in extreme and hence rare cases.

The variability and relationship of weight and sugar content of sugar beets, K. ANDRLÍK, V. BARTOŠ, and J. URBAN (*Ztschr. Zuckerindus. Böhmen, 36 (1912), No. 4, pp. 193–210, figs. 4*).—Tables and charts present data obtained in statistical studies of the weight and sugar contents of various strains of sugar beets.

From data presented, the authors conclude that the weight of the beet root shows fluctuating variability in accordance with the Quetelet-Galton law. Each strain shows its own correlation between root weight and sugar percentage. In only a few unusual cases does it occur that low sugar content accompanies a very unusual root weight, and these cases probably result from abnormalities in the use of plant food.

Contribution on the relation between the sugar content and weight of sugar beets, K. NOVOTNÝ (*Ztschr. Zuckerindus. Böhmen, 36 (1912), No. 5, pp. 269–272*).—This article presents the results of a further investigation and verifies the conclusions of the paper noted above.

Recent chemical and physiological investigations on the sugar beet (*Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 4, pp. 907–911*).—The results of a number of recent investigations are given tending to the following general conclusions:

"It may be considered as settled that a want of light is injurious to the beet crop, giving . . . a product of low industrial value. While it can not be denied that sugar, as saccharose, is formed in the organs of assimilation of the beet, it is not equally certain that it circulates as such in its passage to the organs of reserve. There is no doubt that beets in the second year of growth can produce and store sugar. In general, the correlation between the decrease in sugar content and the increase of weight of root does not hold good. With a perfect selection (élites) the injurious influence of root weight on sugar content can be eliminated."

A bibliography is appended.

Influence of light on the development of the sugar beet, A. STIFT (*Oster. Ungar. Ztschr. Zuckerindus. u. Landw., 40 (1911), No. 6, pp. 849–856*).—The

author summarizes some work of others upon this subject. In his own experiments he found that the weight per plant of the leaves of the shaded samples selected ranged from 188 to 198 gm., as compared with from 221 to 504 gm. in case of the unshaded samples. The weights per root ranged from 51.6 to 81.6 gm. and from 202.3 to 743 gm. in case of the shaded and unshaded beets, respectively. The leaf weight was from almost 2½ to about 3⅝ times as great as the root weight of the shaded samples and from about ½ to 1½ times as great as the root weight in case of the unshaded samples. The sugar content of the shade-grown roots averaged 13.9 per cent, while that of the unshaded roots ranged from 10.8 to 12.9 per cent. The sugar production per shade-grown root averaged 9.2 gm. but ranged from 25.5 to 85.4 gm. in case of the unshaded roots.

The author presents computations from the work of Briem which indicate that the shade-grown roots had a greater average leaf weight and a much smaller average root weight than did the unshaded beets. The work of Strohmer verified this result, and indicated a somewhat lower average sugar content in case of the shade-grown beets and a much lower sugar production per beet.

Other work on this subject has already been noted (E. S. R., 25, p. 236).

[Manganese as a sugar beet fertilizer], E. Zacharewicz (*Rev. Vit., 37 (1912), No. 955, pp. 471–473*).—Three sugar beet varieties gave higher yields on plats that had received manganese at the rate of 150 kg. per hectare (133.5 lbs. per acre) than they did on the check plats. Two other varieties gave higher yields on the check plats. Analyses showed similarly variable results as to density, purity quotient, and the sugar and dry matter percentages.

Report on sugar experiments, 1910–11 (*Bul. Dept. Agr. Jamaica, n. ser., 2 (1912), No. 5, pp. 1–27*).—This is a report of variety and fertilizer tests with sugar cane conducted on a number of estates in Jamaica. Tables state the results of mechanical and chemical analyses of soils of different estates and the cane yields obtained after various fertilizer applications.

Timothy production on irrigated land in the Northwestern States, M. W. Evans (*U. S. Dept. Agr., Farmers' Bul. 502, pp. 32*).—This publication discusses the growing of timothy in mixture with alfalfa in place of clover, a practice at present used in only a few of the more important timothy-producing centers, though well adapted to conditions on most of the irrigated land where timothy is produced, and describes the methods of seeding, irrigating, cultivating, fertilizing, harvesting, and marketing the crop, together with the treatment and management of established timothy meadows and the crop rotations followed in the region.

[Canada weeds and weed seed] (*Canada Dept. Agr., Seed Branch. Bul. S–6, 1911, pp. 70, figs. 177*).—The author divides this bulletin into 3 parts: (1) The Seed Control Act, 1911, and Regulatons Made by the Governor in Council (pp. 3–10); (2) Seed Samples for Purity and Germination Tests (pp. 11–21); and (3) Weeds and Weed Seeds (pp. 22–67). The third part gives descriptions and illustrations of numerous weeds and weed seeds and brief notes on them.

The eradication of wild onion, J. A. Voelcker (*Jour. Roy. Agr. Soc. England, 72 (1911), pp. 404–409*).—Land on which wild onions had grown did not produce a single onion strong enough to set seed during 2 years after it had been treated to a mixture of 14 lbs. orchard grass, 7 lbs. tall fescue, 7 lbs. tall oat grass, 1 lb. rough-stalked meadow grass, 3 lbs. chicory, 8 lbs. burnet, 1 lb. yarrow, 3 lbs. kidney vetch, 1 lb. alsike clover, 2 lbs. late-flowering red clover, and 2 lbs. of white clover, or 49 lbs per acre in all.

Among other methods of eradication tested in pot and plat experiments were applications of lime, gas lime, carbolic acid, sulphocyanid of ammonium, sulphuric acid, arsenic, sulphate of copper, common salt, sulphate of magnesia,

chlorid of magnesium, carbolized lime, and various other materials. Cutting off the flowering heads, pulling up the plants by hand, deep plowing, and burning the soil were also tried without success.

The only field methods which seemed to promise any real success consisted in "lightening the soil by road drift" and "raising the top 8 in. of soil and putting 3 in. depth of ashes below it." "While the use of road drift certainly did good, it was not nearly as good as the employment of ashes." The author regards these results as indicating that the solution of the problem must lie "in the direction of finding some means by which the soil could be rendered lighter and less retentive of water."

HORTICULTURE.

Library of agriculture.—Horticulture and truck farming, H. M. SKINNER and A. L. MCCREDIE (*Chicago, 1912, vol. 4, pp. 539, pls. 17, figs. 145*).—This, the fourth of a series of volumes dealing with agricultural subjects, consists largely of papers which have previously appeared as bulletins of the U. S. Department of Agriculture and of some of the State stations.

Plant protection calendar for field, vineyard, orchard, and garden (*Pflanzenschutzkalender für Feld-, Wein-, Obst- und Gartenbau. Vienna: K. K. Landw. Bakt. u. Pflanzenschutzstat., 1911, pp. 11*).—This calendar outlines the necessary operations throughout the year for combating insect pests, fungus diseases, and other enemies for greenhouse, garden, and field crops.

Influence of fertilizers on the conservation of fruits, N. ESPAULLARD (*Jour. Soc. Nat. Hort. France, 4. ser., 13 (1912), July, pp. 470, 471*).—The author here summarizes the results secured in a 3-year study of the effect of various fertilizer elements on the keeping quality of pears.

The phosphatic and potassic fertilizers were found to produce large handsome fruits without impairing their keeping quality. The use of nitrate of soda alone, however, resulted in shriveled fruit of poor keeping quality. Nitrate of soda appears to stimulate vegetative growth and to hasten maturity at the expense of quality of the fruit.

Profitable fruit storage cellar, W. J. LEWIS (*New England Homestead, 65 (1912), No. 8, pp. 140, 142, fig. 1*).—A fruit storage cellar capable of holding about 6,000 bu. of apples is here described and illustrated.

Orcharding in Maine, A. K. GARDNER and H. P. SWEETSER (*Bul. [Maine] Dept. Agr., 11 (1912), No. 3, pp. 52, figs. 11*).—A popular treatise on apple orcharding.

How to make an orchard in British Columbia, J. T. BEALBY (*London, 1912, pp. 86*).—A popular handbook dealing especially with orchard practices in British Columbia.

The Georgia apple, E. M. HAFER (*Proc. Ga. State Hort. Soc., 36 (1912), pp. 46–52*).—A general discussion of apple culture in the Georgia mountains, including a descriptive list of native Georgia apples.

Pruning olives in Italy, N. PINTO (*Bol. Arbor. Ital., 7 (1911), Nos. 2, pp. 55–65; 3–4, pp. 149–178, figs. 2*).—A descriptive account of the methods employed in pruning olives in the Province of Bari, Italy.

Contribution to the study of the reconstitution of vineyards.—I, The grape scions, or a sketch of the ampelography of Vaud, J. BURNAT and I. ANKEN (*Contribution a l'Étude de la Reconstitution des Vignobles. I, Les Cépages-Greffons ou Essai d'Ampélographie Vaudoise. Geneva and Paris, 1910, pp. XVIII+126, pls. 16*).—This is the first of a series of 3 volumes to deal with the reconstitution of vineyards in the Vaud region. The present volume contains a study of the varieties of grapes grown in this region that have furnished the

scions in the reconstitution of vineyards with American stocks. The succeeding volumes will deal with the results secured with various stocks, scions, and direct bearers.

American stocks for Cape vineyards, A. J. PEROLD and I. TRIBOLET (*Agr. Jour. Union So. Africa, 4 (1912), Nos. 1, pp. 99–109; 2, pp. 222–257*).—This comprises a report of an inquiry into the suitability of the American stocks on which the vineyards in the Cape Province have thus far been reconstructed.

Fruits of warm countries.—I, A general study of the fruits, P. HUBERT (*Fruits des Pays Chauds. I, Étude Générale des Fruits. Paris, 1912, pp. X+728, figs. 227*).—This is the first volume of a 2-volume work dealing with the principal fruits of tropical and subtropical regions. Especial attention is given to the more widely distributed table fruits, including those susceptible to large local consumption and those suitable for developing an export trade. A discussion under each kind of fruit deals more or less in detail with its history, distribution, synonymy, botany, varieties, culture, enemies, uses, and commerce.

A succeeding volume is to treat in detail of the fruit industries in warm climates.

Manurial experiments on cacao in Trinidad, J. DE VERTEUIL (*West Indian Bul., 12 (1912), No. 3, pp. 320–344*).—A description, including the results to date, is given of manurial experiments on cacao and Castilla rubber being conducted on various estates in Trinidad, both by the Trinidad Department of Agriculture and the Trinidad Board of Agriculture. No conclusions are drawn.

The date palm (Phœnix dactylifera) in Egypt, A. PAOLETTI (*Agr. Colon. [Italy], 6 (1912), No. 6, pp. 248–258*).—An account of date culture in Egypt, including also brief notes on the varieties grown.

The planting and care of shade trees (*Trenton, N. J.: Forest Park Reserv. Com., 1912, pp. 128, pls. 5, figs. 43*).—This comprises the 3 following papers, the first two of which were originally published in the report of the Forest Park Reservation Commission of New Jersey for 1908 and are here thoroughly revised: The Planting and Care of Shade Trees, by A. Gaskill and J. O. Hazard (pp. 7–65); Insects Injurious to Shade Trees, by J. B. Smith (pp. 67–91), previously noted (E. S. R., 25, p. 254); and Diseases of Shade and Forest Trees, by M. T. Cook (pp. 93–124).

The pecan, C. A. REED (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 251, pp. 58, figs. 25*).—A practical treatise on the pecan and its culture, discussed under the following general headings: Botanical classification of the pecan, natural distribution, habit of growth, flowering habit, decrease in number of native trees, cultural distribution, extent of planting, economic importance, culture, propagation, stocks for grafting and budding, planting, nut handling, and varieties.

Making a garden of perennials, W. C. EGAN (*New York, 1912, pp. 52, pls. 8*).—A short cultural treatise including lists of dependable perennials for different soils and situations.

Molding concrete flower pots, boxes, jardinieres, etc., A. A. HOUGHTON (*New York, 1912, pp. 52, figs. 8*).—A practical treatise explanatory of the construction of the molds for and the construction of various designs of concrete flower pots, jardinieres, and window boxes of concrete, together with the reinforcement and surface treatment of the casts after molding.

Molding concrete fountains and lawn ornaments, A. A. HOUGHTON (*New York, 1912, pp. 56, figs. 14*).—A practical treatise illustrating and explaining in detail the molds for and the methods of molding various styles of concrete fountains, lawn seats, curbing, hitching posts, pergolas, sundials, lawn vases, and other ornamental garden furniture of concrete.

FORESTRY.

Forestry in New England. R. C. HAWLEY and A. F. HAWES (*New York and London, 1912, pp. XV+479, pls. 2, figs. 140*).—Part 1 of this work furnishes the woodland owner a brief survey of the whole field of industry and provides him with a working knowledge of forestry. The successive chapters discuss silvics, silvicultural systems, silvicultural characteristics of the important New England trees, forest planting and seeding, improvement cuttings, injuries from animals, forest insects and fungi, forest fires, timber estimating and valuation, and growth of trees and forests.

Part 2 deals with New England forests and their management, the subject matter being discussed under the following chapter headings: The original forests and their early development, present forest conditions, the spruce region, the northern hardwoods region, the white-pine region, the sprout hardwoods region, the progress of forestry in New England, and the yield to be expected from New England forests under proper management.

Report on timber conditions around Lesser Slave Lake, D. R. CAMERON (*Dept. Int. Canada, Forestry Branch Bul. 29, 1912, pp. 54, pl. 1, figs. 17*).—This comprises a detailed report of a reconnoissance survey made during the summer of 1911. The general conditions of the region are described and the country examined is discussed by districts. Proposed forest reserves are suggested and a scheme of fire protection, illustrated by a map, is also submitted. A number of tables summarizing the important information about the country are appended.

The forest trees of Britain, C. A. JOHNS, revised by G. S. BOULGER (*London and Brighton, England, 1912, 10. ed., pp. XIV+431, pls. 32, figs. 152*).—A revised edition of the late author's work, which is essentially a handbook of popular information relative to the lore, distinguishing characteristics, adaptation, and planting value of the principal trees and shrubs grown in England. See also a previous note (E. S. R., 26, p. 642).

Notes on Kerry woods, illustrating methods of collecting and utilizing information for a forest survey, R. L. ROBINSON (*Jour. Bd. Agr. [London], 1912, Sup. 9, pp. 64, pls. 7, figs. 4*).—The investigations described were primarily undertaken with the object of obtaining some accurate figures relating to the growth of timber in one of the more hilly districts of Wales. The scope of the work was broadened in order to settle the lines on which a forest survey on a large scale should proceed.

The introductory chapter deals with the topography, climate, geology, and soil of the Kerry woods. The succeeding chapters discuss the methods of measurement and details of growth of different species, together with the utilization of the data for the survey.

Complete yield tables for British woodlands and the finance of British forestry, P. T. MAW (*London, 1912, pp. XII+108, figs. 36*).—This comprises the results of the author's investigations concerning the growth of timber in Great Britain and the financial returns to be obtained therefrom. The tables as given for both deciduous and coniferous trees on different qualities of soil show for various aged stands the amount and value of thinnings removed, crop left after thinning, increment, land rentals per annum from date of planting, and the annual income from a normally stocked forest.

Taxation investigations.—III, Determination of the form of standing trees, T. JONSON (*Skogsvårdsför. Tidskr., 1912, Fackafd., No. 4, pp. 235–275, figs. 11*).—The author's method of determining the total cubical content of standing trees, yield, and increment for the purpose of taxation is described.

A method of investigating yields per acre in many aged stands, H. H. CHAPMAN (*Forestry Quart., 10 (1912), No. 3, pp. 458–469, figs. 3*).—The author discusses the principles involved in determining the area occupied by each age class in a managed forest and gives the details of a plan applied to uneven aged stands of shortleaf pine in Arkansas.

On the arrangement of silvicultural experiments and the classes of forest yield tables, VATER (*Tharand. Forstl. Jahrb., 63 (1912), No. 3, pp. 252–264*).—A discussion of methods of conducting silvicultural experiments.

Seventh annual report of the Forest Park Reservation Commission of New Jersey for the year ending October 31, 1911 (*Ann. Rpt. Forest Park Reserv. Com. N. J., 7 (1911), pp. 92, pls. 14*).—This contains a summarized report of the work of the Forest Commission (pp. 9–18), together with the following detailed reports: The Forest Fire Service, by C. P. Wilber (pp. 19–67), and Report of the State Forester, by A. Gaskill (pp. 68–90).

Progress report of forest administration in the Province of Eastern Bengal and Assam for the year 1910–11, A. V. MONRO and H. CARTER (*Rpt. Forest Admin. East. Bengal and Assam, 1910–11, pp. 92, pl. 1*).—This is the customary report relative to the constitution, management, and administration of the state forests of Eastern Bengal and Assam, including the financial results for the year. All of the important data are appended in tabular form.

Report on state nurseries and plantations for the year 1909–10, W. C. KENSINGTON (*New Zeal. Dept. Lands, Rpt. State Nurseries and Plantations, 1909–10, pp. 38, pls. 6*).—This comprises the combined reports of the superintending nurserymen of the New Zealand forest nurseries and plantations under their supervision for the financial year ended March 31, 1910.

Emory oak in southern Arizona, F. J. PHILLIPS (*U. S. Dept. Agr., Forest Serv. Circ. 201, pp. 15, pls. 5*).—An account is given of the Emory oak (*Quercus emoryi*) relative to its range and occurrence, climate, soil and moisture requirements, associated species, characteristics of the tree, causes of injury, utilization, and management.

Report on the investigation of bamboo as material for production of paper pulp, W. RAITT (*Indian Forest Rec., 3 (1912), No. 3, pp. 37, pls. 2*).—This comprises a report of investigations conducted under the direction of the Forest Research Institute to determine the suitability of 5 different species of bamboo for the manufacture of cellulose at a marketable cost.

The author found that where the cost of delivery to mill sites is not excessive, all 5 species are suitable for the manufacture of cellulose, and that all the species, except one, may be mixed in treatment. The culms of all ages may be mixed indiscriminately in treatment, and nodes need not be rejected, providing the following treatment is adopted: Culms not to be cut until the shoots of the year are full-grown; a period of seasoning of not less than 3 months to elapse before they are used; crushing; extraction of starchy matter; and digestion with sulphate liquor. Neither the sulphite nor the soda process was found to be economical in the production of cellulose from bamboo.

Rubber: Its culture and preparation, K. W. WOLF-CZAPEK (*Der Kautschuk: Seine Gewinnung und Verarbeitung. Berlin, 1912, pp. 132, figs. 51*).—This comprises a concise handbook of information relative to the collection, preparation, commerce, and chemistry of rubber, as well as the vulcanization and manufacture of soft and hard rubber articles.

A short bibliography is appended.

[Rubber in the Federated Malay States], L. LEWTON-BRAIN (*Fed. Malay States, Rpt. Dir. Agr., 1911, pp. 1–10*).—A report on rubber culture in the Federated Malay States for the year 1911, which discusses acreages, cultiva-

tion, manufacture, insect pests, and diseases. The total acreage planted with rubber at the end of 1911 was 352,974 as compared with 245,774 acres in 1910.

The excretion of serum from moist rubber after pressing, A. ZIMMERMANN (*Pflanzer, 8 (1912), No. 7, pp. 389–398*).—In experiments conducted to determine a method of preventing further excretion of moisture from rubber after being pressed, a method devised by D. Sandmann, which consists in immersing the pressed rubber in boiling water for a short time, was found to reduce materially the subsequent excretion of serum. The author suggests the need of further experiments to determine the effect of the boiling water on the physical properties of rubber.

Commercial creosotes with special reference to protection of wood from decay, C. P. WINSLOW (*U. S. Dept. Agr., Forest Serv. Circ. 206, pp. 38, figs. 17*).—In continuation of previous investigations relative to the properties, methods of analysis, etc., of various creosotes (E. S. R., 19, p. 812), the results to date are here presented of an investigation of the quality and prices of commercial creosotes.

An account is given of the more important sources of wood-preserving creosotes, methods used in their production, their general properties and the quality, price, and quantity of the creosotes annually consumed in this country. A series of fractional distillation and index of refraction curves are given for samples classed as coal-tar creosotes and mixed coal-tar creosotes. Samples of a large number of authentic coal tars, oil tars, and wood tars have been collected from which creosotes are being distilled and critically analyzed and examined. A number of these samples are here classified and described in tabular form, the data given showing the character of the oil, the fractions, and the residue, together with the sulphonation residues of fractions.

The method used in analyzing the creosotes discussed is appended.

Bibliography on forestry published during 1911 (*Skogsvårdsför. Tidskr., 1912, Fackafd., No. 3, pp. 217–232*).—The bibliography includes literature on forestry topics published in the German, French, English, and Scandinavian languages.

DISEASES OF PLANTS.

The relation of certain parasitic fungi to the age and development of the host plant, M. T. COOK and J. J. TAUBENHAUS (*Abs. in Phytopathology, 2 (1912), No. 2, p. 98*).—According to the authors, experiments have proved that laboratory inoculations made on picked fruits or detached portions of plants are not sufficiently reliable for definite conclusions. It has been found that there is a difference in resistance between picked fruits kept in the laboratory and unpicked ones, and between young and older fruits of the same tree, as well as between fruits of different varieties. This resistance is held to be intimately associated with the cell contents of the host. It is believed that *Glomerella rufomaculans* of the apple is able to attack many different hosts and that this explains the presence of so many so-called new species.

Studies on the biology and morphology of Kuehneola albida and Uredo mülleri, S. STRELIN (*Mycol. Centbl., 1 (1912), No. 5, pp. 131–137*).—From his investigations the author concludes that these are two developmental forms of one and the same fungus.

Notes on some heterœcious rusts of Connecticut, G. P. CLINTON (*Abs. in Phytopathology, 2 (1912), No. 2, p. 94*).—The author reports the teleutospore stage of *Gymnosporangium japonicum* for the first time in America, it having been collected on two different importations of *Juniperus chinensis* from Japan. *Peridermium peckii* is shown by artificial inoculations to be the æcidial stage of *Puccinia strum myrtilli*. *Pinus austriaca*, *P. maritima*, and *P. [illegible]* are

reported as new American hosts for *Peridermium pyriforme*. Notes are also given on species or stages of fungi not previously reported from Connecticut.

The development of Glœosporium malicorticis, H. S. JACKSON (*Abs. in Phytopathology, 2 (1912), No. 2, p. 95*).—A description is given of the perfect or ascospore stage of *G. malicorticis*, which the author has been having under observation for a number of years.

Pure cultures of the ascospores were made, and inoculation experiments showed that it takes one year for the cankers to mature. All inoculations produced typical cankers, which bore conidia typical of *G. malicorticis*.

Attention is called to the resemblance both in conidial and ascospore stages to the fungus *Pseudopeziza ribis*. The exact generic position of the fungus is somewhat doubtful, but it is described as *Neofabrea malicorticis*, a new combination.

The structure and development of crown gall: A plant cancer, E. F. SMITH, NELLIE A. BROWN, and LUCIA MCCULLOCH (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 255, pp. 60, pls. 109, figs. 2*).—This bulletin is in continuation of one previously issued (E. S. R., 25, p. 243), and gives detailed descriptions of a large number of plates made in studying this disease, the histological evidence being based upon them.

[Crown gall on mangolds in England], R. H. BIFFEN (*Jour. Roy. Agr. Soc. England, 72 (1911), p. 378, fig. 1*).—A tumor-like outgrowth on the roots of mangolds observed in 1910, and more closely studied in 1911, is found to be a case of crown gall ascribed to *Bacterium tumefaciens*. This disease has been certainly identified only in Norfolk and Shropshire, but is suspected to exist on raspberry roots in Cambridgeshire. Further investigations are contemplated.

On two injurious fungi of garden plants, G. KÖCK (*Separate from Bl. Obst, Wein, Gartenbau u. Kleintierzucht, 1911, No. 11, pp. 3*).—The author discusses briefly a fungus sent him for examination from Silesia on a species of Erica, supposed by him to be *Oïdium ericinum*, also a myxomycete, said to be *Spumaria alba*, found on young asters and spreading in manure beds. The results of his measurements and observations are also given.

Treatment of seed wheat for smut (*Agr. Gaz. N. S. Wales, 23 (1912), No. 5, p. 396*).—Trials were made with 0.5 per cent, 1 per cent, 1.5 per cent, and 2 per cent solutions of bluestone, and also of the effect of dipping the wheat in limewater afterwards.

These tests showed that any solution of bluestone stronger than 1.5 per cent is likely to affect seriously the germination of the grain, and even at this strength it is advisable to dip the wheat in a mixture of 1 lb. lime to 20 gal. of water.

Trials of alleged preventives for smut in wheat (*Agr. Gaz. N. S. Wales, 23 (1912), No. 5, p. 394*).—This is a summary of reports from experiments at the Cowra, Wagga, and Bathurst experiment farms with two commercial preparations, claimed to prevent smut in wheat, as compared with bluestone (2 per cent) and limewater.

One of these was found to be equal to bluestone as a protective, but both affected the germinating power to a greater extent, so that neither is recommended as a substitute for bluestone.

The diseases of ginseng and their control, H. H. WHETZEL and J. ROSENBAUM (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 250, pp. 44, pls. 12, figs. 5*).—This is a second attempt to bring together the information relating to the diseases of the drug plant known as ginseng, the first publication having been previously noted (E. S. R., 16, p. 271). The data presented on each disease are arranged under the heads of history, symptoms, cause, and control. Among the

diseases described are Alternaria blight, Phytophthora mildew, Vermicularia stem anthracnose, Pestalozzia leaf anthracnose, papery leaf spot, injury caused by cold following the use of Bordeaux mixture, the damping off of seedlings due to Rhizoctonia, Pythium, etc., wilts due to Acrostalagmus and Fusarium, nematode root galls, and root rots due to a number of causes. The spraying of ginseng, soil sterilization, relation of fertilizers to diseases, and the drainage of ginseng beds are also discussed.

An external dry rot of potato tubers, Miss C. O. Jamieson and W. H. Wollenweber (*Jour. Wash. Acad. Sci., 2 (1912), No. 6, pp. 146–152, fig. 1; abs. in Mycol. Centbl., 1 (1912), No. 6, p. 180*).—A Fusarium was found on potatoes affected with dry rot which was proved by inoculation experiments to be a wound parasite capable of causing this disease. The fungus is claimed to be a new species, distinguished by its two forms of conidia, and is described by the authors under the name *F. trichothecioides* n. sp. It claimed that the disease is clearly differentiated from the wilt and dry rot ascribed to *F. oxysporum*.

The relationship of Oospora scabies to the higher bacteria, G. C. Cunningham (*Abs. in Phytopathology, 2 (1912), No. 2, p. 97*).—A study of cultures of the organism causing the potato scab has led to the conclusion that the organism should be placed in the genus Streptothrix, one of the higher bacteria.

Biochemical research on leaf-roll of potato.—III, Chemical characters, G. Doby (*Kisérlet. Közlem., 15 (1912), No. 2, pp. 210–222; Ztschr. Pflanzenkrank., 22 (1912), No. 4, pp. 204–211*).—Further analyses (E. S. R., 26, p. 547) lead the author to conclude (1) that the chemical composition of tubers affected with this disease shows different variations from those observed in the case of sound ones, but that the limits of such variations are as yet difficult to determine on account of complications arising from such influences as soil, weather, variety of potatoes, etc.; (2) that the diseased tubers show a lower average in dry substance, ash, protein, and carbohydrates as a whole; (3) that the sound and diseased tubers differ most in the total and the composition of their dry substance and in starch; and (4) that the biochemical processes are more retarded in diseased than in sound plants, but that it is probably not yet practicable to distinguish diseased potatoes on the basis of chemical analyses alone. The results are given in tabulated form.

Treatment of seed potatoes with formalin (*Agr. Gaz. N. S. Wales, 23 (1912), No. 5, p. 408*).—In an experiment at the Bathurst Experiment Farm, seed potatoes treated with formalin to prevent the development of scab and other diseases were practically a failure, while plats of untreated seed germinated well.

Gummosis, L. P. de Bussy (*Meded. Deli-Proefstat. Medan, 6 (1911), No. 2, pp. 77–89*).—An account of studies carried on during 1910–11 on gummosis of tobacco.

This disease is claimed to be caused in case of the plants studied by *Bacillus solanacearum*, which is alleged to attack also other plants. Artificial inoculations, it is stated, developed infection in case of potato, indigo, sesame, tomato, and other economic plants. The details are given of investigations carried out on the influence of cultivation and manuring on the progress of the disease.

The Deli form of Bacillus solanacearum, J. A. Honing (*Meded. Deli-Proefstat. Medan, 6 (1912), No. 7, pp. 219–250*).—This is a detailed account of the author's studies on the morphological and physiological characters of *B. solanacearum*, claimed to cause gummosis of tobacco and other plants at Medan, and a detailed comparison of these characters with those of *B. nicotianæ*, said to cause a like disease of tobacco in Japan. The conclusion is reached that the two properly belong to the same species, the former being probably a somewhat weakened form of the species.

A serious root disease of radish, J. T. BARRETT (*Abs. in Phytopathology, 2 (1912), No. 2, p. 96*).—A disease of radishes, characterized by a peculiar browning or blackening of a portion or all of the root, is described. The infected tissue in the early stages of the disease remains sound and brittle, but as the disease progresses the cells are broken down and rots due to saprophytic forms frequently set in. The organism which causes the disease is said to be *Aphanomyces levis*, long known as a saprophyte inhabiting the soil and water. No successful means of control have yet been determined.

Tomato leaf rust (*Jour. Bd. Agr. [London], 18 (1912), No. 11, pp. 920, 921, pl. 1; abs. in Mycol. Centbl., 1 (1912), No. 6, p. 181*).—Leaves, stems, and occasionally fruits are attacked by this disease, ascribed to *Cladosporium fulvum*. Fungicides avail only when applied to germinating spores. The entire surface of the tomato plant should, therefore, be covered frequently with half-strength Bordeaux mixture if the plants are young, but with potassium sulphid solution (1 oz. in 4 gal. of water) if flowers and young fruit are present.

Treatment of chlorosis in fruit trees and vines, L. HILTNER (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 10 (1912), No. 5, pp. 49–51*).—In continuation of previous studies (E. S. R., 25, p. 518), experiments were made in supplying iron and other salts to chlorotic trees and vines. The salts were made up into a mash or porridge with water and introduced into holes bored in the trunks, the holes being afterwards closed with corks and tree wax. With the exception of a few cases in which the holes are thought to have been in dead tissue, the experiments were considered successful, being followed by the restoration of the green color and by luxuriant growth.

Oily or glassy fruits, I. GROSS (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 10 (1912), No. 5, pp. 56, 57*).—Attention is called to an oily or glassy appearance said to be confined almost exclusively to apples. This is noted in spots on the surface or beneath the skin, injuring the appearance and sometimes the flavor of the fruit. It is said that frequently as much as 5 per cent of the fruit is thus affected, and sometimes a much larger proportion, the trouble being especially noteworthy in 1911.

Inoculation experiments with fungi associated with apple leaf spot and canker, C. E. LEWIS (*Phytopathology, 2 (1912), No. 2, pp. 49–62*).—The author began in 1908 a study of the fungi associated with apple diseases in Maine orchards, and in the present paper the results of inoculations with fungi isolated from diseased branches and leaves are given.

A considerable portion of the leaf spot which occurs in Maine orchards is said to be due to the fungus *Sphæropsis malorum*, although similar spotting has been observed in orchards which is attributed to injury due to spraying with Bordeaux mixture. Thus far, Sphæropsis has been the only fungus isolated from apple leaves in the State which has caused spotting on the leaves when inoculations were made from pure cultures. *Phyllosticta limitata*, *Coniothyrium pirina*, and *Coryneum foliicolum* grew and fruited on dead spots when the spores were sprayed on the leaves, but no new spots were produced.

A number of fungi have been found to occur on branches and twigs of the apple. Of these Sphæropsis does the greatest damage, but it has been proved by inoculation experiments that Coryneum and Phoma can cause considerable injury to the young trees and branches of orchard trees. Myxosporium and Cytospora, it is claimed, do not attack healthy branches, but may attack weakened ones.

Some notes on Sphæropsis malorum, C. BROOKS and MARGARET DEMERITT (*Abs. in Phytopathology, 2 (1912), No. 2, p. 94*).—The authors report having isolated two forms of Sphæropsis from decaying apples. One produces spores typical of *S. malorum*, while the other has spores that are longer and more

oblong in outline. The two forms retain their distinctive characteristics when grown on the same culture medium. Both have been obtained from the fruit. The pycnidia from cankers have nearly always contained the long spores. In inoculations on foliage, positive results have been obtained only with the long-spored form. The large number of leaf spots beneath cankers are believed to furnish evidence of the transfer of the fungus from the limb to the leaves.

Apple fruit spot and quince blotch, C. BROOKS and CAROLINE A. BLACK (*Phytopathology, 2 (1912), No. 2, pp. 63–72, pls. 2*).—This paper includes a second report on the fruit spot of apples (E. S. R., 20, p. 847) and a discussion of a similar disease of quinces.

A Phoma stage has been found for the fungus causing the fruit spot of apples, and as a consequence the name of the fungus has been changed from *Cylindrosporium pomi* to *Phoma pomi*. A spot similar to that on apples is reported on quinces, and cross inoculations have shown that it is due to the fungus mentioned above. This disease has been previously noted (E. S. R., 4, p. 656).

Three destructive diseases of the peach, E. O. ESSIG (*Mo. Bul. Com. Hort. Cal., 1 (1912), No. 8, pp. 337–359, figs. 4*).—These diseases are peach yellows, peach rosette, and little peach. In case of each an account is given of the history of the disease, its destructiveness, distribution, the plants attacked, nature and symptoms of the disease, its modes of distribution, and recommendations looking to its control. To this is added the author's correspondence with various sources of information, also the California state quarantine law relating to peach yellows and rosette.

The method of spreading of the olive knot disease, W. T. HORNE, W. B. PARKER, and L. L. DAINES (*Abs. in Phytopathology, 2 (1912), No. 2, p. 96*).—This is a progress report on studies carried out near Sacramento, Cal., to discover a method for controlling the olive knot disease due to *Bacterium savastanoi*.

No biting or piercing insect or other transporting agent was discovered, but it was found that vigorous knots exude bacterial slime when wet. It was demonstrated, both by platings from the slime and from direct inoculations, that this slime contains the organism in abundance, and its dissemination is accounted for by the spattering of rain, and the accidental transfer by birds, insects, or other agencies. Entrance into the living bark is believed usually to take place on healed wounds.

Comparative experiments with certain sprays for controlling Peronospora viticola on the grape, A. BRETSCHNEIDER (*Ztschr. Landw. Versuchsw. Österr., 15 (1912), No. 2, pp. 147–152*).—This series of experiments repeats with certain extensions previous ones already noted elsewhere (E. S. R., 25, p. 751), results being given in detail with discussions of comparative cost in employment of the various preparations tested.

The downy mildew fungi and their control, A. BRETSCHNEIDER (*Monatsh. Landw., 5 (1912), No. 5, pp. 138–147, figs. 6*).—Continuing the above the author gives a brief discussion of certain Peronosporaceæ as enemies of various fruits, trees, wild plants, etc., with recommendations as to preventive and remedial measures.

A knot of citrus trees caused by Sphæropsis tumefaciens, FLORENCE HEDGES and L. S. TENNY (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 247, pp. 74, pls. 10, figs. 8*).—This bulletin gives an account of an infectious disease of citrus trees which has caused extensive losses in Jamaica. The same or a similar trouble has been recently discovered in the United States. The investigations reported have extended through a period of 6 years, during which time the

cause of the disease has been established by means of repeated inoculations, reisolations, and reinoculations.

The fungus causing the disease, *S. tumefaciens*, has been isolated from knots on lime and orange trees, and small knots have been also obtained from pomelo, lemon, tangerine, and *Citrus trifoliata*. The fungus penetrates the tissues far beyond the original point of infection, and a badly infected tree is a mass of tumors, sometimes not more than half an inch separating them. On the other hand, there may be considerable distance between two secondary tumors with no external evidence of the fungus, but microscopical examination reveals its presence in small quantities throughout the intervening portion of the stem. Occasionally an abnormal number of new shoots grow from the knots, forming witches' brooms, and this is said to be a characteristic of the disease under favorable conditions. Ultimately that portion of the branch above the knot dies.

Notes are given on the life history of the fungus, which was found to live for several years in the host.

It is suggested that affected limbs be removed, cutting them well below the lowest knots, and that badly diseased trees be uprooted and burned.

Citrus scab, H. S. Fawcett (*Florida Sta. Bul. 109, pp. 47–60, figs. 8*).—A description is given of the citrus scab, due to *Cladosporium citri*. This fungus has been isolated from sour orange leaves and cultivated, and infection experiments have been made demonstrating that it is the cause of the trouble described.

The fungus seems particularly injurious to sour orange and lemon sprouts, and the author recommends the destruction of these, together with spraying with ammoniacal copper carbonate or Bordeaux mixture. The copper carbonate solution is preferred since it usually does not cause an increase of scale insects as sometimes follows the use of Bordeaux mixture. Where the disease is very prevalent the first spraying should be done soon after the petals fall, followed by a second in 2 weeks or a month, and a third at a similar interval if necessary. New growth which comes out at unseasonable times and late bloom, locally known as "June bloom," are said to be most subject to infection, and these should be cut out and destroyed.

A bibliography is appended.

Notes on some diseases of trees in our national forests, II, G. G. Hedgcock (*Phytopathology, 2 (1912), No. 2, pp. 73–80*).—In continuation of a previous account (E. S. R., 23, p. 456), the author describes some diseases of deciduous and coniferous trees. The principal fungi attacking deciduous trees enumerated are *Polyporus dryophilus, P. texanus, P. sulphureus, Fomes igniarius, F. everhartii, F. nigricans, F. applanatus, F. fasciatus, F. fraxinophilus*, and *F. robiniæ*, while on coniferous trees he notes the occurrence of *Trametes pini, P. schweinitzii, F. laricis, Echinodontium tinctorium, P. sulphureus, P. amarus, Lentinus lepideus*, and *Hydnum coralloides*.

The chestnut bark fungus, Diaporthe parasitica, C. L. Shear (*Phytopathology, 2 (1912), No. 2, pp. 88, 89*).—A brief discussion is given of the generic and specific identification of this organism and its relation to some other fungi.

Some observations on experiments with the chestnut bark disease, J. F. Collins (*Abs. in Phytopathology, 2 (1912), No. 2, p. 97*).—The author points out that the mycelium of this fungus, contrary to common belief, can penetrate and continue to grow in the wood under an old diseased spot after the infected bark has been removed and the surface of the wood treated with tar, paint, etc., and that fruiting pustules may at times be produced in abundance on bare wood; that summer spores are not as liable to be blown about by the wind as has been

previously considered; and that threads of summer spores are dependent mainly, if not wholly, upon moisture conditions for their development.

The chestnut bark disease in Massachusetts, A. H. Graves (*Abs. in Phytopathology, 2 (1912), No. 2, p. 99*).—The distribution of this disease in Massachusetts is traced, and the author states that it would probably be practicable for the State to adopt control measures in the northern and eastern parts. Coppice was found to be no more susceptible than seedlings, but burned areas are more apt to be infected than those untouched by fire. The best time for locating the chestnut bark disease is said to be during the month of August.

Summer and fall observations on the growth of the chestnut bark disease in Pennsylvania, Caroline Rumbold (*Abs. in Phytopathology, 2 (1912), No. 2, p. 100*).—The results of observations on the fungus extending from July to winter are given.

During the summer period the rate of growth of mycelium and production of spores is said to be affected principally by moisture, and this period lasts until the latter part of December. During the transition period the pustules darken in color, often fall off, the mycelium disappears, and the pycnidia become sterile. Specimens collected on the first of December in different parts of the State showed perithecia with ascospores.

Preliminary notes on a twig blight of Quercus prinus, Della Ingram (*Abs. in Phytopathology, 2 (1912), No. 2, pp. 96, 97*).—A disease of the chestnut oak which was noted in the spring and summer of 1911 is described. The range of the disease has not been definitely determined, but it has been reported from Connecticut and from various points in Virginia, Maryland, and Pennsylvania.

When viewed at a distance the diseased trees have the appearance of having been attacked by fire blight, the branches and leaves having the brown, blighted appearance characteristic of that disease. The fungus *Dothiorella quercina* has been found associated with the disease and is believed to be the cause of the trouble.

Tannic acid as protection for oak wood against dry rot, C. Wehmer (*Mycol. Centbl., 1 (1912), Nos. 5, pp. 138–148, figs. 6; 6, pp. 166–174*).—Pursuant to previous studies (E. S. R., 26, pp. 551, 752; 27, p. 355), the author experimented on the growth of *Merulius lacrymans* as affected by tannic and gallic acids in various cultures. Solutions of from 0.5 to 5 per cent strength were found to hinder or stop growth in nearly all solutions. Pine wood, ordinarily attacked and destroyed by this fungus, was protected by a 1 to 2 per cent solution. Practical applications are suggested.

Bacterial black spot of walnut, L. Rodway (*Agr. Gaz. Tasmania, 20 (1912), No. 3, pp. 85, 86, fig. 1; abs. in Jour. Dept. Agr. So. Aust., 15 (1912), No. 10, p. 991*).—The author notes the appearance of this disease in many of the walnut trees about Hobart. It appears first as small black spots on the surface of both nut and leaf. The disease spreads rapidly, involving finally all parts of both nut and leaf, weakening the tree so that death results in a few years. It appears to start on the surface from new infection each year, the parasitical bacteria gradually penetrating deeper layers of cells as the vitality of the tree becomes reduced by the disease. The trunk, however, does not seem to be attacked directly. It is thought that consistent spraying with Bordeaux mixture will greatly reduce the attack. Removal of infected parts in early stages of the disease is also recommended.

Peridermium cedri as a destructive fungus, R. S. Troup (*Indian Forester, 38 (1912), No. 5, pp. 222, 223, pl. 1*).—This fungus, which produces the characteristic witches' brooms on Deodar trees in certain parts of the Himalayas

but which has hitherto been considered as practically harmless, is here stated to have been found by the author to cause needle-cast, resulting death of branchlets, cessation of growth in height, forking, and consequent worthlessness of the poles attacked. Removal of all infected parts and trees is suggested as a possible check to the disease.

Parasitism of Phoradendron juniperinum libocedri, E. P. MEINECKE (*Abs. in Phytopathology, 2 (1912), No. 2, p. 92*).—The author briefly describes the occurrence of this parasite on *Libocedrus decurrens*. He concludes that as it is capable of living for a great number of years without developing any green exterior parts, the plant has become a true parasite.

The use of fungicides to prevent damping off, C. HARTLEY (*Abs. in Phytopathology, 2 (1912), No. 2, p. 99*).—The author reports the serious damping off of pine seedlings in a nursery in western Nebraska, most of the disease being caused by *Pythium debaryanum*, although Fusarium and Rhizoctonia caused some damage.

Different methods of soil treatment were tested, and it was found that sulphuric acid gave the best results. This was applied in an aqueous solution at the time of seed sowing, about 0.2 fluid ounce being used per square foot of seed bed. Injury to seedlings is prevented by light watering twice daily until germination is complete.

The detection of inert ingredients of fungicides, E. WALLACE and L. H. EVANS (*Abs. in Phytopathology, 2 (1912), No. 2, p. 95*).—A brief account is given of work carried out for the Insecticide and Fungicide Board of this Department to test various substances in relation to their action on conidia of *Glomerella rufomaculans* and *Sclerotinia fructigena*.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Proceedings of the Seventh International Zoological Congress (*Proc. 7. Internat. Zool. Cong., 1907 [pub. 1912], pp. 972, figs. 102*).—Among the papers of interest to the economic zoologist and entomologist are the following: The Reactions of Sarcophagid Fly Larvæ to Light, by W. B. Herms (pp. 152, 153); The Immunity of Caterpillars of *Galleria mellonella* against Tubercle Bacilli and Some Other Microbes, by S. Metalnikoff (p. 282); The Immunity of Caterpillars of *G. mellonella* to Microbes and Their Diseases, by V. Nedrigailoff (p. 283); The Relations Between the Hemipterological Faunas of Europe and North America, by G. Horváth (pp. 560–571); The Recent Progress and Present Condition of Economic Entomology, by L. O. Howard (pp. 572–600); Polymorphism in Hemiptera and Some of Its Significances, by H. Osborn (pp. 601–603); The Influence of Minimum Temperatures in Limiting the Northern Distribution of Insects, E. D. Sanderson (pp. 604, 605), previously noted (E. S. R., 20, p. 851); A Contribution to Our Knowledge of Insecticides, by C. T. McClintock, E. M. Houghton, and H. C. Hamilton (pp. 613–628), previously noted (E. S. R., 25, p. 362); Eradication of The Southern Cattle Tick, by B. H. Ransom (pp. 648–655), previously noted (E. S. R., 24, p. 260); Notes on *Scutigerella immaculata*, its Eggs and Larvæ, by S. R. Williams (pp. 656–659); Ridding a State of Mosquitoes, by J. B. Smith (pp. 662, 663); A Problem in Antigeny, by C. H. Fernald (pp. 664–667); The Influence of Hibernation and Migration on Animal Parasites, by H. B. Ward (pp. 673–684); Geographical Variation in Birds with Special Reference to Humidity, by C. W. Beebe (699–701); and Distribution of Mosquitoes in North America, by H. G. Dyar (pp. 956, 957).

Proceedings of the First International Entomological Congress (*1. Cong. Internat. Ent. Brussels, 1 (1910), pp. 277, pls. 5; 2 (1910), pp. 520, pls. 27*).—Among the papers of interest to the economic entomologist, all of which are in the second volume, are the following: "Springtails" (Collembola): Their Economic Importance, with Notes on Some Unrecorded Instances of Damage, by F. V. Theobald (pp. 1–18); The Calliphorine Cutaneous Parasites of Domestic Animals, by L. Gedoelst (pp. 19–28); The Control and Disinfection of Imported Seeds and Plants, by D. Morris (pp. 33–40); The Distribution of the Yellow Fever Mosquito (*Stegomyia fasciata*) and General Notes on Its Bionomics, by F. V. Theobald (pp. 145–170); Destruction of Mosquitoes by Small Fish in the West Indies, by D. Morris (pp. 171, 172); *Sphenoptera lineata* (*geminata*) and the Larva of a Lepidopteron which Attacks the Sulla (*Hedysarum coronarium*) in Tunis and Sicily, by T. de Stefani Perez (pp. 185–194); The Influence of Röntgen Rays on the Development of Lepidoptera, by K. Hasebroek (pp. 195–198); Ants and Their Hosts, by H. Donisthorpe (pp. 199–208); Ants and Their Guests, by P. E. Wasmann (pp. 209–234); Notes on Distribution and Ecology of North American Jassidæ, by H. Osborn (pp. 235, 236); The Polyctenidæ and Their Adaptation to a Parasitic Life, by G. Horvath (pp. 249–256); Preliminary Notes on the Importance of the New Family Urothripidæ in the Study of the Thysanoptera, by R. S. Bagnall (pp. 283–288); Notes on the Œstridæ, by G. H. Carpenter (pp. 289–294); The Utilization of Insects, Particularly the Coleoptera, in Zoogeographic Questions, by J. Sainte-Claire Deville (pp. 305–312); Observations on the Lepidopterous Enemies of the Cotton Plant in Egypt and Method of Combating Them, by A. Andres (pp. 317–320); A Note on Methods of Preserving Insects in Tropical Climates, by F. M. Howlett (pp. 357–360;) The Conservation of Types, by W. J. Holland (pp. 361–368); Mimicry, by F. A. Dixey (pp. 369–384); One Hundred Years of Entomology in the United States, by H. Skinner (pp. 425–432); The Nidification, Biology, and Parasites of Some Hymenoptera, by R. G. Mercet (pp. 457–464); Progress and Economic Entomology in India, by H. Maxwell-Lefroy and F. M. Howlett (pp. 465–482); and Economic Entomology in Trinidad, by F. W. Urich (pp. 509–516).

Insects injurious to corn, D. T. Fullaway (*Hawaii Sta. Bul. 27, p. 20, figs. 8*).—While the importance of corn and other cereals in Hawaii has gradually waned, especially of late years, due to the losses occasioned by cutworms and other pests which have increased enormously with the depletion of the golden plover, it is thought that with the control of the cutworm the cultivation of corn will increase from year to year.

The insects mentioned as attacking corn include wireworms, cutworms, army worms, plant lice, leaf hoppers, defoliating caterpillars, earworms, and grain feeders. Two species of wireworms, namely, *Simodactylus cinnamomeus* and *Monocrepidius exsul*, have been observed commonly about corn plantations. The commoner species of cutworms attacking corn are *Agrotis ypsilon*, *A. crinigera*, *Cirphis unipuncta*, and *Spodoptera mauritia*. The most important natural enemies of cutworms are the tachinid flies *Frontina archippivora* and *Chatogædia monticola*, *Ichneumon koebeli*, and birds, especially the mynah, golden plover, and Chinese pheasant.

Aphis maidis is the species commonly found on corn, sorghum, and other cereals. "Aphids have many natural enemies, which tend to keep them in check and at times render them innocuous, notably the ladybird beetles *Coccinella repanda*, *C. abdominalis*, *Platyomus lividigaster*, *Scymnus notescens*, and *S. vividus*, the syrphid fly *Xanthogramma grandicornis*, the *Leucopis grandicornis* (Fam. Agromyzidæ), and minute internal parasites—cynipids, chalcids, and braconids. A small black encyrtid, first noticed by Mr. Swezey in 1906,

is parasitic on *Aphis maidis*. It has been propagated by the writer for several months and is found to be highly efficient. In several lots examined, about 90 per cent of the plant lice had succumbed. . . .

"Corn is almost invariably attacked by a small leaf hopper, *Peregrinus maidis*, which is often so abundant on small plants as to effect a rapid withering of the plants and ultimately their complete destruction. The injury they do results from their draining the leaves of sap and slitting the midrib for the insertion of their eggs. The secretive habits of these leaf hoppers makes it very difficult to control them by artificial means." Little success has been had in the control of the leaf hopper with the use of sprays.

Plusia chalcites is especially injurious to young plants and *Amorbia emigratella*, a leaf roller, is found on plants in all stages of growth. Neither of these is considered particularly destructive to corn, since they are both very general feeders. *Batrachedra rileyi*, *Cryptoblabes aliena*, nitidulid beetle larvæ, and the coffee bean weevil (*Araecerus fasciculatus*) commonly infest the ears of corn. The Angoumois grain moth and the rice weevil are said to be the most important enemies of stored grain.

Insect notes, H. A. Ballou (*Agr. News [Barbados], 11 (1912), Nos. 270, pp. 282, 283, fig. 1; 271, p. 298, figs. 4*).—The author reports observations made during the course of a trip to St. Kitts to study the insect enemies of sugar cane. The first paper discusses the injury to cane caused by *Termes flavipes;* the second discusses *Lachnosterna patruelis*, which occurs in considerable numbers, and a new root borer that is also quite common.

Insects injurious to mushrooms, C. H. Popenoe (*U. S. Dept. Agr., Bur. Ent. Circ. 155, pp. 10, figs. 7*).—The insects which more commonly attack mushrooms are maggots, mites, springtails, and sowbugs, the first mentioned being the most generally injurious. The mycetophilids *Sciara multiscta* and *S. agraria* and the phorid *Aphiochæta albidihalteris* are the species attracting the most attention as pests. In combating these maggots measures should be undertaken early in the season which will eliminate them from the mushroom house and prevent their subsequent entrance. They may be prevented from gaining entrance in manure from compost beds by heating to a temperature of 150° F. Fumigation with bisulphid of carbon just previous to planting the mushrooms is also productive of good results in destroying the maggots in the compost. Fumigation with tobacco is one of the best methods of destroying the adults.

The mushroom mite (*Tyroglyphus lintneri*) at times becomes so abundant in mushroom beds as to cover the surface of the compost and when present in such numbers is extremely destructive, feeding upon the mushrooms in all stages and penetrating the beds and destroying the mycelium. It is thought to be the cause in many cases of the failure of the spawn to grow. Besides the injury to the mycelium they cause damage to the fruiting bodies by eating into them, distorting or destroying the young growth. Under certain conditions the hypopus or migratory stage of this mite is produced. By means of sucking disks on the ventral surface of the body it attaches itself to insects and is transported to suitable breeding grounds in other localities, resulting in its appearance in localities far from previously infested beds. This mite may also obtain access to mushroom houses in infested compost or in spawn from infested houses. It is but little affected by fumigants suitable for the control of other mushroom pests, and the only measures applicable appear to be those of prevention. A predaceous mite belonging to the Gamasidæ frequently occurs in beds infested by the mushroom mite, feeding upon the latter and at times becoming so numerous as to entirely wipe out the pest.

Springtails (*Achorutes armatum*), which are present in almost all manure, where they feed on the decaying vegetation present, at times become quite injurious in mushroom houses. Mention is made of an outbreak of this pest in St. Louis, Mo., in which a bed 150 ft. in length was completely destroyed. Fumigation with hydrocyanic-acid gas at a strength of from 3 to 6 ounces to each 1,000 cu. ft. of air space will reduce their numbers without injuring the mycelium.

Two species of sowbugs, the greenhouse pillbug (*Armadillidium vulgare*) and dooryard sowbug (*Porcellio lævis*), may become the source of injury through their attacks on the caps or fruiting bodies of the mushrooms. The remedies mentioned include hand picking, pouring hot water along the cracks in the boards and in other places where the bugs may be concealed by day, and treatment with sulphur dioxid after the mushroom crop has been harvested and the compost removed. The plastering of the wet surface of cut potatoes with Paris green and laying them about on the beds is frequently successful in entirely ridding the houses of this pest. Certain crickets are also said to eat into the caps of the mushrooms, *Ceuthophilus pacificus* being mentioned as causing extensive injury to cultivated mushroom beds on the Pacific coast.

In summarizing the circular the author calls attention to the fact that the building should be as tight as possible with few outlets and screened with fine wire gauze.

The leopard moth and other insects injurious to shade trees in the vicinity of Boston, J. W. CHAPMAN (*Cambridge, Mass.: Harvard Univ., 1911, pp. 51, pls. 7*).—This paper, consisting of 3 parts, is based upon the studies conducted by the author in large part in the college yard of Harvard University.

Part 1 (pp. 6–29) is devoted to the leopard moth (*Zeuzera pyrina*), its history, descriptions of its stages, life history and habits, economic importance, natural enemies, and suggestions in regard to control, with a bibliography of 31 titles. In combating the pest the author finds pruning and the cutting back of all infested parts to be very effective if the larvæ have not secured too great a hold on the trees and can not be reached individually with applications of carbon bisulphid or through the use of a wire. This is said to be most effective where the young larvæ are just beginning to show in the twigs and tips of small branches which wilt and die. They can be successfully reached by a pair of hooks such as are ordinarily used to remove the nests of the brown-tail moth. The author reports having taken 300 larvæ in this manner from a single elm. Bisulphid should be used, if possible, in all cases where the larvæ can not be reached by use of a wire. Other substances besides putty and grafting wax which may be used for stopping the holes are clay, coal tar, and in some instances a wooden plug driven into the hole and then sawed off close to the bark. The pupa, like the larva, can be destroyed by a wire, carbon bisulphid, or by simply closing the opening to the outside. Since the moths are attracted to light, a large number may be destroyed in this way.

In part 2 (pp. 30–40) the author describes and discusses the life history and habits, economic importance, etc., of the elm bark-beetle (*Eccoptagaster multistriata*), a preliminary account of which has been previously noted (E. S. R., 23, p. 564). A bibliography of 22 titles is included.

In part 3 (pp. 41–45) brief notes are given on the carpenter moth (*Prionoxystus robiniæ*), elm-bark borer (*Hylesinus opaculus*), elm-leaf miner (*Kaliofenusa ulmi*), elm-leaf beetle (*Galerucella lutcola*), oyster-shell bark-louse, San José scale, white-marked tussock moth, elm-gall louse (*Colopha ulmicola*), woolly elm-tree louse (*Schizoneura rileyi*), and brown-tail moth. In an appendix food plants of the leopard moth are listed by families.

A manual of Philippine silk culture, C. S. BANKS (*Manila: Bur. Sci., 1911, pp. 53, pls. 20*).—This work collates all the data accumulated during the 6 years that the Bureau of Science has propagated mulberry silkworms in the Philippine Islands, with a view to making them accessible to persons who desire to enter upon the commercial production of silk.

Cutworms and army worms, A. GIBSON (*Canada Dept. Agr., Div. Ent. Bul. 3, 1912, pp. 29, pl. 1, figs. 10*).—The first part of this bulletin deals with the nature of cutworm injuries, their life history, natural enemies, and preventive and remedial measures. The more common species of cutworms, namely, the red-backed cutworm (*Euxoa ochrogaster*), the greasy or black cutworm, *Agrotis ypsilon*), the variegated cutworm (*Peridroma saucia*), the dark-sided cutworm (*E. messoria*), the white cutworm (*E. scandens*), the W-marked cutworm (*Noctua clandestina*), the spotted cutworm (*N. c-nigrum*), the glassy cutworm (*Hadena devastatrix*), the yellow-headed cutworm (*H. arctica*), the clover cutworm (*Mamestra trifolii*), the dingy cutworm (*Feltia ducens*), the army worm (*Heliophila unipuncta*), and the black army worm (*N. fennica*) are then dealt with.

It is stated that many new and hitherto unpublished observations on the life histories of several species are recorded.

The present outbreak of the fall army worm and recommendations for its control, JAMES WILSON (*U. S. Dept. Agr., Office Sec. Circ. 40, pp. 2, fig. 1*).—This circular calls attention to the fact that *Laphygma frugiperda*, which has been present in unprecedented numbers from Louisiana and Arkansas eastward to the Atlantic Ocean and destroyed corn, cotton, sugar cane, rice, and other crops, can be best controlled by the application of arsenical poisons and the working of the soil.

The present outbreak of the grass worm or fall army worm and recommendations for its control, JAMES WILSON (*U. S. Dept. Agr., Office Sec. Circ. 40, rev., pp. 4, figs. 3*).—This is a revision of the circular noted above.

Damage to sugar-cane juice by the moth stalk-borer (Diatræa saccharalis), D. L. VAN DINE (*Porto Rico Sugar Growers' Sta. Circ. 1, pp. 11*).—This circular deals with the effect of the borer injury on the sucrose content and purity of the juice of infested stalks, and reports comparative analyses of sound and borer-infested stalks of cane.

The author finds that "there is a direct loss in sugar and a decided reduction in the purity of the juice of cane infested by the moth stalk-borer. This loss in Porto Rico exceeded 670 lbs. of sugar per acre of cane in which the infestation was not apparent except upon examination, the yield averaging 41 tons of cane per acre and the stalks being normal and healthy in appearance. The loss increases in direct proportion to the number of joints of the cane stalks infested by the borer. There is more fiber and less juice in borer-infested cane. The actual weight of borer-infested cane is less than that of sound cane, and it is considered that the juice deteriorates more rapidly in infested cane when cane is allowed to stand without being crushed for any length of time after harvest."

The "wilt disease," or "flacherie," of the gipsy moth, W. REIFF (*Boston: State Forester, 1911, pp. 60, pls. 2, figs. 5*).—In part 1 (pp. 7–12) a brief account is given of caterpillar diseases in general. Part 2 (pp. 12–14) consists of a brief résumé of experiments with flacherie in 1909, an account of which has been previously noted from another source (E. S. R., 22, p. 357). Part 3 (pp. 14–52) reports the details of flacherie experiments conducted in 1910.

In the course of the work artificially developed flacherie was planted after the dying off of the breeding material had begun among the gipsy moth cater-

pillars in 12 separate localities. By taking the average of these results it was found that the total number of apparently living eggs had been decreased by introduction of the artificially developed flacherie to about 14 per cent.

The "experiments prove conclusively that flacherie has an injurious influence upon the prosperity of the gipsy moth caterpillars, this influence varying according to the manner and time of the appearance of the disease. There was no difference noticed in the progress of the wilt which broke out naturally and that of the artificially developed flacherie. The latter, however, is probably the more important factor, for with its help we may be able to introduce the disease among caterpillars of localities in which the wilt, perhaps, would not make its appearance naturally. . . . In selecting the localities in which the disease is to be introduced it is unimportant whether the caterpillars of the gipsy moth are present in large or small numbers. . . . Wherever the naturally as well as the artificially developed flacherie occurs the female caterpillars will always succumb to it more readily than the male."

Studies on the wilt disease, or "flacherie" of the gipsy moth, R. W. GLASER and J. W. CHAPMAN (*Science, n. ser., 36 (1912), No. 920, pp. 219–224*).—The authors, who have been engaged for several months in the study of the cause and nature of the wilt disease of gipsy moth caterpillars, have found polyhedral bodies clustered about their tracheæ analogous to those which have been found in the silkworm and nonne (*Lymantria monacha*) caterpillars. These bodies have a very high refractive index and resist all stains with the exception of iodin, in which they take on a uniform tint. By using a high magnification small wriggling organisms were observed in the fat cells and other cells at such times as the polyhedral bodies were clustered around the tracheæ. "These moving organisms were stained and found to be bacteria. From this time on we pursued the work along bacteriological lines and we believe have been able to demonstrate the etiological connection of these bacteria with the disease." They were found in great numbers in all parts of the intestine and in many caterpillars appeared to be in the act of perforating its walls. "The fat cells seem to be particularly liable to attack, which probably accounts for the saponified nature of the fat of sick caterpillars. . . . The organism in question is very small, having a diameter of only 0.51 to 0.85 μ. . . . It resembles the pneumococcus very closely except that it is motile, progressing in a gyrating manner. For this reason and because it seems to be an undescribed form, we have named it Gyrococcus."

In inoculation experiments 10 caterpillars out of 12 inoculated in the proleg succumbed to the disease. Two out of the 10 died in the pupal stage, while of the 2 surviving 1 was still in the pupal stage at the time of writing and 1 had emerged. Ten of the 12 inoculated in the dorsal vessel died and the remaining 2 were still pupæ. All of the deaths are said to have been typical of flacherie. The 2 lots used for feeding experiments all died without a single exception. In order to exclude the possibility of having inoculated an ultravisible virus together with the Gyrococcus, a large number of caterpillars were prepared (blood tested) for inoculation and feeding with material passed through the Berkefeld filter. These all survived while those treated in the same manner with the unfiltered culture all died.

"The disease is probably spread in nature by the juices of disintegrated caterpillars flowing over the leaves which are later eaten by others. We have found Gyrococcus in the feces, and the fact that such excretions are washed over the leaves by rain seems to show that the disease may also be spread in this manner. What economic value the flacherie disease may have in combating the gipsy moth, we are not prepared at present to say. We have no

experimental evidence whatsoever that the disease may be air borne, as claimed by Mr. Reiff, although of course we do not wish to exclude such a possibility."

The paper concludes with a brief description of the new organism, *Gyrococcus flaccidifex* n. g. and n. sp.

Studies of the wipfelkrankheit of the nonne moth, K. ESCHERICH and M. MIYAJIMA (*Naturw. Ztschr. Forst u. Landw., 9 (1911), No. 9, pp. 381–402, figs. 6*).—This article first briefly reviews the subject and discusses its diagnosis, then reports observations and experiments on the transmissibility of the virus of wilt disease in nun moth caterpillars, the course of the disease, and nature of the virus.

The Mycetophilidæ of North America, Part IV, O. A. JOHANNSEN (*Maine Sta. Bul. 200, pp. 57–146, pls. 7*).—In this fourth paper (E. S. R., 27, p. 57) the species of the remaining genera of the subfamily Mycetophilinæ are characterized together with those of the subfamily Sciarinæ. "The members of the former so far as known injure mushrooms only; the latter constitute the most important group so far as the agriculturist is concerned.

"Though occasionally reported as injuring mushrooms the members of the Sciarinæ are not as a rule regarded as serious pests of the fleshy fungi, differing in this respect from the species of the other subfamilies. After partial decay of fungus growths, however, larvæ of Sciara are found in abundance, and it is this fact which, in some cases at least, has led observers and growers to attribute the destruction to these gnats when in all probability the injury was caused by species of Mycetophila, Exechia, or Phorids. On the other hand there is no lack of evidence of the harmful character of some species of Sciarinæ to seed corn, to potatoes, to wheat, and to the roots of other plants."

The biology of the cockchafer (*Terre Vaud., 3 (1911), No. 50, pp. 453–455, fig. 1; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 2, pp. 572–574*).—This paper presents a brief account of work carried on by Decoppet, who has conducted studies at Farzin, in the Canton of Vaud, Switzerland, in a region where the farm and forest injuries caused by the pest are often very great, the roots and foliage of seedlings and trees (pines, spruces, larches, and silver firs), grasses, and some field crops being attacked.

The action of carbon disulphid on cockchafer larvæ and on the growth of some forest trees, DECOPPET (*Bul. Soc. Vaud. Sci. Nat., 5. ser., 48 (1912), No. 176, pp. XXXV, XXXVI; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 6, pp. 1456, 1457*).—The author found that carbon disulphid at the rate of from 1 to 1½ oz. per square yard injected into 6 or more holes considerably diminished the injury caused by white grubs. In some of the experiments conducted the loss due to their attack in beds thus treated was reduced to 1 or 2 per cent, although it amounted to 20 per cent at the commencement and 80 per cent in untreated beds. Carbon disulphid also has a beneficial effect in stimulating the growth of vegetation.

The author concludes that the "application of carbon disulphid should become a regular practice in forest nurseries; it will not destroy all the white grubs in the soil, but will greatly reduce their number, thus permitting the plants to make new roots; and owing to the effect of the disulphid, the absorption of assimilable substances in the soil is increased, as is shown by the increased power of resistance possessed by the young trees. The disulphid must be injected into the soil as uniformly as possible, at the rate of 1 to 1½ oz. per square yard in 6 to 8 holes. Ground recently broken up should not be treated,

and some days should elapse after the application of the disulphid before plowing. Further, the soil must be neither too damp nor too dry. As the disulphid vapor sinks in the soil it must not be injected to a depth of over 6 in."

The destruction of the cockchafer in the forest nursery, DECOPPET (*Schweiz. Ztschr. Forstw., 63 (1912), No. 4, pp. 122–129, pls. 2, fig. 1*).—This is a more detailed account of the investigations noted above, which have been under way since 1904.

The white grub of sugar cane in the island of Mauritius, A. VUILLET (*Sucr. Indig. et Colon., 80 (1912), No. 14, pp. 253–255*).—This is a résumé of the present knowledge of the scarabæid *Phytalus smithi* and the means of combating it.

The control of the boll weevil, W. D. HUNTER (*U. S. Dept. Agr., Farmers' Bul. 500, pp. 14*).—The matter contained in this publication is extracted largely from Bulletin 114 of the Bureau of Entomology, previously noted (E. S. R., 27, p. 562). It contains a brief outline of the methods which have been tested under various conditions and sums up the present available knowledge concerning the subject of control.

The honeybee, a guide to apiculture in Canada, C. G. HEWITT (*Canada Dept. Agr., Div. Ent. Bul. 2, 1912, pp. 45, pls. 2, figs. 14*).—This bulletin furnishes information for the practical beekeeper.

A revision of the Ichneumonidæ based on the collection in the British Museum, with descriptions of new genera and species, C. MORLEY (*London, 1912, pt. 1, pp. XI+88, pl. 1*).—The present work, which deals with the tribes Ophionides and Metopiides, is said to be the commencement of a revision of the family Ichneumonidæ. Five genera and many species are described as new to science.

The ichneumon flies of America belonging to the tribe Ophionini, C. W. HOOKER (*Trans. Amer. Ent. Soc., 38 (1912), No. 1–2, pp. 176+176a–176c, pls. 3*).—This revision of the Ophionini is based upon extensive museum and private collections, all but 4 of the types existing in America having been examined. Most of the species attack lepidopterous larvæ, including the army worm, cotton worm, zebra caterpillar, the large Cecropia larvæ, etc. *Ophion bifoveolatus*, however, apparently confines itself to the larvæ of Lachnosterna. Synonymic lists are given of the genera and species. A number of species are described as new to science.

The clover mite (Bryobia pratensis), F. M. WEBSTER (*U. S. Dept. Agr., Bur. Ent. Circ. 158, pp. 5, figs. 3*).—This is a summarized account of the clover or brown mite. This pest attacks the leaves of clover, grasses, and fruit and other trees, feeding upon and often destroying them. In addition, during winter and spring it frequently swarms in dwellings, often crawling about in myriads over windows, furniture, pictures, curtains, etc. As a whole, throughout its known area of distribution, it is probably of more importance to the fruit grower than to the farmer. While east of the semiarid region it is found largely on clover and blue grass, it is at present largely an orchard pest west of about longitude 100°. "With the possible exception of Georgia, the pest seems to occur generally over the whole country, except perhaps in the Gulf States and the Dakotas, though just why it should not be found even there can not now be explained."

Caterpillars of *Tineola bisselliella*, one of the common clothes moths, have been observed to feed upon the eggs of this mite. A minute black lady beetle (*Scymnus punctum*) and lace-winged flies are also recorded as predaceous enemies.

Frequent reference is made to the investigations conducted by the Colorado Station, previously noted (E. S. R., 23, p. 264).

List of insecticide dealers, C. W. Woodworth (*California Sta. Circ. 79, pp. 23*).—This circular lists the firms which have been licensed to sell insecticides and fungicides in California for the year ending June 30, 1913.

FOODS—HUMAN NUTRITION.

Practical suggestions for the preparation of frozen and dried eggs, Mary E. Pennington (*U. S. Dept. Agr., Bur. Chem. Circ. 98, pp. 12, pls. 3, fig. 1*).—A study of the fundamental facts underlying the problem of the preservation of eggs and egg products.

Examinations of eggs which had been commercially candled for breaking were made at different times at 6 different factories. The appearance, odor, and sometimes the taste of the egg when removed from the shell were added to the candler's description. Laboratory examinations were made to determine the number of bacteria present, and whether or not the organisms were of the colon type. The amount of nitrogen obtained from the eggs was analyzed according to the Folin aeration method.

With the exception of the eggs having green-colored whites, musty eggs, sour eggs, and eggs with a pronounced odor which the candler can not always distinguish, the eggs going to the breakers after careful handling were found to be, bacteriologically speaking, a clean, wholesome food. The eggs, however, were handled under very different conditions and the product varied greatly in bacterial content, although the percentage of loosely combined nitrogen did not vary to any great extent.

The bacterial content of egg products was proved to be largely a matter of handling, because there was a wide variation between the output of the different plants, and when eggs used by all of them were opened in a laboratory under aseptic conditions they were found to contain but few bacteria. Conversely, when they were opened in the laboratory according to methods prevailing in egg-breaking establishments, the product sometimes approximated closely that obtained in a commercial establishment. The fingers of the breaker were found to be one prolific source of trouble, as they are constantly wet. The dishes used were found to be another source of contamination, and in order to overcome this an improved egg-breaking outfit is illustrated and described. Suggestions are also offered for the construction of a suitable room for egg breaking, so that bacterial cleanliness may be preserved.

"Arrangements should be made for washing and sterilizing utensils outside of the breaking room. All eggs should be chilled at a temperature below 40° F. for 24 hours, as soon as received, candled in a chilled candling room (not above 65°), and transferred as soon as candled to the breakers. The liquid egg should go at once, preferably while the temperature is below 45°, in its ultimate containers, to a quick freezer. This necessitates a low-temperature room on the premises. . . . It is believed that, properly conducted, the freezing and drying of eggs is an industry which is economically desirable, as long as the centers of egg production and egg consumption are so widely separated, and as long as the poor handling methods bring to the concentrators of the producing sections such enormous numbers of eggs that are wholesome but not available for long hauls."

Oats in human nutrition, Pluchet and Niviot (*Bul. Soc. Nat. Agr. France, 72 (1912), No. 7, pp. 586–591*).—Attention is called to the advantages which, in the authors' opinion, oats possess as food for man, and to experiments by Moreau of the French Army which appear to indicate that the addition of oats in some form or other to the ration increases the endurance of soldiers

Mention is made of a kind of bread made in Norway and Sweden of oatmeal mixed with ground pine bark.

Rice (*Cuba Mag., 4 (1912), No. 2, pp. 77–80*).—A discussion of the use of rice, with a collection of recipes, a number of them for Cuban dishes.

Bacterial changes in bread, E. KAYSER (*Bul. Soc. Sci. Hyg. Aliment., 1 (1911), No. 3–4, pp. 349–357*).—These experiments were made to ascertain the cause of viscosity and ropiness in bread and to discover a remedy for it.

It was found that the micro-organism (which is described) may be introduced in the yeast, the water, the milk, or the flour. To prevent the bread from spoiling the following remedies are suggested: Cleanliness, including washing the dough trough and other baking utensils with boiling acidulated water; addition of from 1 to 2 liters of vinegar to each 100 kg. of flour, or the addition of some form of lactic acid to the dough; in severe cases, changing the flour, the yeast, the milk, or using boiling water; and baking for a considerable time, 30 minutes being required for a 500-gm. loaf.

The cause and prevention of other defects in bread caused by micro-organisms and similar topics are discussed.

Bacterial changes in bread, E. KAYSER and H. DELAVAL (*Ann. Inst. Nat. Agron., 11 (1912), 2. ser., No. 1, pp. 143–153, fig. 1*).—See above.

A study of ropy bread, ANNA W. WILLIAMS (*Biochem. Bul., 1 (1912), No. 4, pp. 529–534*).—Experiments made to determine the cause of ropiness in bread and to devise preventive measures are reported.

The trouble was found to be due to the presence in the flour of a short, thick, sluggishly mobile, rod-bacillus having a capsule. The infected flour may also contain a coccus which produces a pink crumb, preceded by a characteristic odor of rope. The development of ropiness may be prevented by keeping the bread dry and at low temperature. Thin dough and underbaking favor the rapid development of ropiness, while buttermilk used in mixing the dough will tend to hinder the development.

Increased cost of living and the use of food pastes, E. JACQUET and G. ROVESTI (*Bul. Soc. Sci. Hyg. Aliment., 1 (1911), No. 3–4, pp. 358–370*).—Increased use of food pastes such as macaroni is recommended as a means of reducing the cost of living. Analyses of these pastes are presented, and it is noted that the better grades contain a relatively high proportion of ash, fat, and cellulose, but less nitrogenous matter than the cheaper grades. Consideration is given to the selection of wheat, the drying of the paste, criteria of the quality of paste, kinds of paste, and trade statistics. Suggestions are given for increasing the use of this sort of food.

Soy bean and condensed milk (*Med. Rev. of Reviews, 18 (1912), No. 8, p. 513*).—In this summary of data a combination of the soy bean or its flour with sweetened condensed milk is recommended as an infant food as a substitute for fresh milk when the latter is not safe. The soy bean is valuable also in the treatment of diabetes on account of the absence of starch. Its flour is said to contain 44.6 per cent protein, 19.4 per cent fat, and 9.3 per cent cane sugar.

The caloric estimation of percentage-mixtures of milk, F. G. OPPENHEIMER (*Med. Rev. of Reviews, 18 (1912), No. 9, p. 645*).—Fraley's method is cited which makes use of the formula $2F+S+P\times1\frac{1}{2}\ Q=C$, in which F represents the percentage of fat, S of sugar, P of protein, Q the quantity in ounces, and C the caloric value.

A nutrition investigation on the insoluble carbohydrates or marc of the apple, E. C. SCHNEIDER (*Amer. Jour. Physiol., 30 (1912), No. 3, pp. 258–270*).—The results of studies are reported of the composition of the apple and

apple marc, bacteria, enzyms, digestion, and utilization, and data reported by other investigators are summarized.

According to the author, 35.87 per cent of pentosan and 45.83 per cent of galactan were obtained from the marc by hydrolysis with hydrochloric acid. Intestinal bacteria destroyed the hemicelluloses of the marc and pectin, as well as the pentosan and galactan of the pectin, and did not form reducing sugars as an end product. Neither the marc nor its pectin was hydrolyzed by animal enzyms, malt diastase, or "taka" diastase. Weak solutions of hydrochloric acid split off from the marc pectin and reducing sugars. In digestion experiments made with human subjects from 79.1 to 84.5 per cent of the hemicelluloses of the marc was utilized or destroyed, probably by bacterial activity. Of the pentosan 88.69 per cent was digestible, and of the galactan 76.78 per cent.

Official inspections (*Maine Sta. Off. Insps. 37, pp. 13–24; 39, pp. 73–88; 40, pp. 89–100*).—The first of these publications reports the results of the examination of a number of samples of carbonated beverages and ice cream; the second reports results of the examination of a number of miscellaneous food materials, and discusses sanitary food and related topics; and the third, the results of the examination of drugs.

Food inspection decision (*U. S. Dept. Agr., Food Insp. Decisions 146, 147, pp. 1 each*).—These decisions have to do with the use of saccharin in foods, and with absinth.

School lunches and medical inspection, I. S. Wile (*Med. Rev. of Reviews, 18 (1912), No. 9, pp. 593–598; Jour. Home Econ., 4 (1912), No. 4, pp. 345–352*).—Arguments favoring the school lunch are presented in this summary of data, which includes the author's experience in school lunch work in New York City.

Cost of living in Mexico, P. E. Holland and W. L. Bonney (*Daily Cons. and Trade Rpts. [U. S.], 15 (1912), No. 199, pp. 966–969*).—Statistical data relating to the cost of living, and a description of the preparation of some Mexican dishes (tortillas, tamales, and enchiladas), are given.

Food in Syria, M. Labbé and J. Ziade (*Bul. Soc. Sci. Hyg. Aliment., 1 (1911), No. 3–4, pp. 371–381*).—A detailed description of the foods generally consumed in Syria is given.

The results of dietary studies are presented. In the case of a man weighing 85 kg. the daily food supplied from 138 to 147 gm. protein, the energy value being from 2,878 to 3,037 calories. In another case, with a man weighing 105 kg., the diet supplied about 228 gm. protein and 5,466 calories; and in a third case, with a man weighing 70 kg., 125 gm. protein and 3,848 calories.

According to the author's data, Syrian diet contains little meat and practically no alcohol. It contains large quantities of carbohydrates, and, they believe, supplies too much fat.

The pathology of fat metabolism, F. M. Hanes (*Bul. Johns Hopkins Hosp., 23 (1912), No. 253, pp. 77–82; abs. in Med. Rev. of Reviews, 18 (1912), No. 6, p. 412*).—"Fatty degeneration" is an inexact term for a variety of cell injuries accompanied with the appearance of fat.

Lipins (lipoids) of cells include not only neutral fats, fatty acids, and soaps, but also more complex substances which should be studied in connection with both normal and abnormal metabolism. Lipins are constant cell constituents, usually in invisible form, becoming visible with certain injuries to the cell, and forming fatty accumulations of lipins which the cell can not utilize and which are not the result of degenerative transformation of the cytoplasm into fat. These accumulations are physiological or pathological infiltrations. Glyceryl-ester infiltration indicates injury to the containing cell, and cholesteryl-ester

infiltration indicates necrobiosis of neighboring cells. Chronic degenerative lesions produce cholesteryl-ester infiltration. Autolysis causes the invisible lipins of the cell to assume a visible form, differing from the lipins deposited in the cell during life. This process (myelinic decomposition) is not related to the process of fatty infiltration.

The influence on the respiratory exchange of varying amounts of carbohydrate in the diet, F. G. BENEDICT and H. L. HIGGINS (*Amer. Jour. Physiol., 30 (1912), No. 3, pp. 217–232, dgm. 1*).—In these experiments diets supplying uniform amounts of protein and approximately the same number of calories, but with varying amounts of carbohydrates and fats, were fed to several individuals, and during 4 days measurements of the gaseous metabolism, particularly the respiratory quotient, were made.

It was found that with the diet unchanged on the preceding evening the respiratory exchange of any individual the next morning before eating is always the same. With normal subjects the same diet gives the same respiratory quotient the morning after a meal. A distinct relation was found between the supply of body carbohydrate (measured by the respiratory quotient after digestion has ceased) and the quantity of carbohydrate in the preceding diet. In men of sedentary habits even 600 gm. of carbohydrate daily for 4 days did not produce glycosuria.

The influence upon metabolism of nonoxidizable material in the intestinal tract, F. G. BENEDICT and L. E. EMMES (*Amer. Jour. Physiol., 30 (1912), No. 3, pp. 197–216*).—These experiments were made in the attempt to determine whether the increase in metabolism (measured by oxygen consumption and carbon dioxid elimination) following ingestion of food is caused principally by the presence of oxidizable material in the blood or by muscular work involved in the process of digestion. Respiration apparatus previously described (E. S. R., 21, p. 665) was used.

In 6 experiments the subject took a dose of 15 gm. of sodium sulphate in 200 cc. of water. No considerable increase in either oxygen or carbon dioxid was noted, in spite of the intense peristalsis produced. Hence, the authors conclude, it is erroneous to cite the results of earlier experiments in support of the idea that intestinal movements have a very considerable effect upon total metabolism.

Seven experiments were made in which the subjects ingested considerable quantities of agar-agar, either dry or in the form of a jelly. None of this material, except a very little carbohydrate, is absorbed. No increased metabolism due to increased segmentation was noted, and the movement along the intestines of the material did not appear to require the expenditure of a measurable amount of energy. "It would therefore appear that the 'work of digestion,' in so far as either peristalsis or possibly the segmentation process is concerned, can not be of sufficient moment to play an important rôle or to explain in any degree the marked rise in metabolism so frequently noted after the ingestion of various food materials."

The physico-chemical basis of striated-muscle contraction, I, W. N. BERG (*Biochem. Bul., 1 (1912), No. 4, pp. 535–537*).—This is a criticism of the Zuntz theory of muscle contraction.

Studies of the animal body as a prime mover, M. RINGELMANN (*Bul. Soc. Sci. Hyg. Aliment., 1 (1911), No. 3–4, pp. 337–348, dgms. 3*).—This is an attempt to devise a method for measuring the power obtained from man or the lower animals, in the same way that an engineer determines the power of a prime mover. The analogy between the animate and inanimate machines is carried out in considerable detail, and formulas are presented for the measurement of

the force, speed, and power of the animate machine, just as there are formulas for determining these attributes in the case of an inanimate machine.

Experiments with cattle showed a relation between the effort of an animal and its weight, and between its effort and the dimensions of certain muscles. The speed of the animate motor is affected by the length of the limbs, by the angular velocity at which the various levers move in a vertical plane, and by the number of movements in a unit of time.

If f represents the mean effort, P the weight of the motor, n the ratio of f to P, v the mean speed, H the height of the motor, n' the ratio of v to H, and fv the power of the motor, $fv=nn'$ (PH). Experiments demonstrate that f increases with P, while v increases to a maximum and then diminishes with increase in P. A graphic curve illustrates these relations. It may be possible to make the coefficients n and n' utilizable practically, their value depending on the age of the motor, or anatomical and physiological peculiarities, such as the dimensions of some parts of the animate machine, the frequency of respiratory movements or of the pulse, the temperature, etc.

In the experiments with cattle it was found that the maximum effort was about four times the mean, and the maximum speed about three times the mean.

If F equals the maximum effort, f the mean effort, a the ratio of f to F, V the maximum speed, v the mean speed, b the ratio of v to V, and m the utilizable power of the animate machine, $m=fv=(ab)$ FV. Since a and b appear to be constants for animals of the same species, age, etc., the product of the maximum speed and effort of an animal is the measure of its utilizable power.

Other analogies between animate and inanimate machines are presented.

A new calorimeter bomb with special advantages as to material of construction and method of operation, S. W. Parr (*Jour. Indus. and Engin. Chem., 4 (1912), No. 10, pp. 746–748, figs. 4*).—The advantages of the calorimeter here described are: It is constructed of a new alloy of nickel, copper, tungsten, and chromium, with smaller amounts of manganese, aluminum, titanium, boron, and silicon, the alloy being very much cheaper than platinum, equally resistant to acids, and far less liable to fracture than enamel; rubber gaskets are substituted for the usual lead ones, permitting the securing of a perfect seal with the minimum of compression, this substitution being possible through the devising of a method of construction which prevents burning of the rubber; an improved form of valve for the admission of oxygen and release of gases after combustion; and a simple and efficient method of fastening the cap and sealing the cover.

Some tests on a new calorimeter bomb, R. H. Jesse, Jr. (*Jour. Indus. and Engin. Chem., 4 (1912), No. 10, pp. 748, 749*).—An account is given of tests of the calorimeter bomb described above.

Tests with acids showed that the material of which the apparatus is constructed is sufficiently acid proof. Indirect proof indicates that the substitution of rubber gaskets for lead did not affect results, the amount of rubber exposed to the gases being a ring only 0.001 of an inch wide, and the gases being cooled by passing through a very narrow space between masses of cool metal before coming in contact with the rubber. No odor of burnt rubber was noted, and the constancy of the results was such as would hardly have been possible had any rubber at all been burnt. Tests with sugar showed that the apparatus is accurate within 0.07 per cent and tests with benzoic acid showed an accuracy within 0.04 per cent, which is as close an agreement as could be expected when temperatures are measured with a mercury thermometer, and which compares very favorably with the best work of electrical thermometers.

ANIMAL PRODUCTION.

Digestion experiments with Texas hays and fodders, G. S. Fraps (*Texas Sta. Bul. 147, pp. 5–28*).—The average composition of feeding stuffs used in the digestion experiments reported in this bulletin was as follows:

Composition of Texas hays and fodders.

Kind of feeding stuff.	Water.	Protein.	Ether extract.	Nitrogen-free extract.	Crude fiber.	Ash.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Alfalfa hay	10.99	16.17	1.41	34.96	28.34	8.14
Bermuda hay	9.74	6.43	1.60	46.70	27.62	7.88
Bur clover	9.73	23.43	2.12	31.83	20.81	12.10
Buffalo grass	7.30	7.05	1.20	45.43	27.64	11.55
Corn shucks	7.75	3.20	.68	54.60	30.32	3.47
Cowpea hay	12.73	14.66	3.02	34.37	26.18	9.05
Guam grass	7.66	8.43	1.73	49.40	26.00	6.79
Johnson grass hay	8.69	7.44	1.68	42.44	27.40	12.36
Do	8.06	6.92	1.40	44.73	30.76	8.13
Kafir fodder	8.57	9.90	2.13	44.33	23.80	11.25
Millet	9.42	4.22	1.62	48.37	27.91	8.97
Oat hay	8.36	8.04	2.41	44.22	27.87	9.02
Peanut hay	8.60	13.56	8.56	39.02	22.82	7.44
Para grass	8.36	3.44	.91	46.74	33.80	7.10
Rice straw (Japan)	6.68	3.92	1.24	37.82	33.26	17.10
Rice straw (Honduras)	7.46	3.98	1.15	40.62	30.65	16.16
Sorghum hay	10.56	5.58	1.66	47.24	28.07	6.91
Vetch hay	6.76	15.00	1.58	37.53	27.28	11.87

The bur clover was cut when in bloom with most of the seed corn and dried in a large air-drying apparatus in the laboratory before chopping. It was free from dirt and was readily and completely eaten. Samples of bur clover were also collected at various stages of growth and gave the following analytical results:

Composition of bur clover at different stages of growth.

Stage of growth.	Date collected.	Water.	Protein.	Ether extract.	Nitrogen-free extract.	Crude fiber.	Ash.	Water lost in air-drying.
		Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Just in bloom	Mar. 23	3.02	27.10	4.18	40.49	14.12	11.09	83.8
Full bloom, part of seeds formed	Apr. 2	7.43	24.00	3.23	38.19	16.95	10.20	83.5
Most of seeds formed	Apr. 14	2.72	20.75	2.97	41.13	21.85	10.58	84.5
Still in bloom	Apr. 21	5.96	21.06	3.92	38.47	21.25	9.40	82.6
Part of leaves dying, still blooms	Apr. 28	5.95	16.43	2.48	40.70	25.59	8.85	74.6
All seeds formed, some leaves dry, dropping off	May 7	6.90	15.70	2.58	36.76	30.58	7.48	58.8
Most of leaves and burs dropped off	May 20	7.05	11.01	1.84	33.46	38.25	8.39	56.7

The results of digestion experiments with sheep are given in the following table:

Coefficient of digestibility of Texas hays and fodders.

Kind of feeding stuff.	Protein.	Ether extract.	Nitrogen-free extract.	Crude fiber.	Ash.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Alfalfa hay	73.8	4.9	65.0	45.4	58.0
Bermuda hay	48.9	46.9	50.2	50.8	28.0
Bur clover	80.7	5.4	75.9	64.2	62.6
Buffalo grass	53.2	35.5	58.0	58.4	24.3
Corn shucks	12.5	38.6	60.6	69.3	21.5
Cowpea hay	72.3	28.6	65.3	51.5	11.0
Guam grass	50.7	57.2	53.8	57.1	28.4
Johnson grass hay	41.0	52.2	52.3	65.9	13.9
Do	51.8	49.3	61.0	67.6	33.4
Kafir fodder	63.0	53.1	69.4	67.1	43.6
Millet	30.3	56.4	59.3	65.1	31.3
Oat hay	58.5	68.9	66.8	67.8	28.4
Peanut hay	78.6	90.0	74.3	52.4	21.3
Para grass	9.9	45.0	46.9	52.8	23.2
Rice straw (Japan)	16.8	6.4	45.0	60.3	12.1
Rice straw (Honduras)	26.6	36.4	47.3	58.0	15.0
Sorghum hay	31.6	53.5	65.0	66.8	33.8
Vetch hay	74.2	42.4	74.5	54.5	28.3

Fodder crops of the Punjab, J. M. Douie ([*1912*], *pp. II+31+VII, pls. 2*).—This describes methods of feeding cattle and discusses the food value of native and introduced plants used as fodder for live stock.

Statistical investigations into the utilization of fodder crops and capital by means of live stock in various districts in Germany, F. Waterstradt (*Arch. Exakte Wirtschaftsforsch., 4 (1912), No. 1, pp. 88–128; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 6, pp. 1412–1418*).—This is a study of 443 farms, in which the results are arranged according to the Thünen system in the order of progressive decrease of the income derived from cattle and other domestic animals, in order to determine by such means their relation to the total receipts of the farm and the factors of production.

From the results, which are prepared in tabular form, there seems to be a correlation between the income produced by cattle and the net and gross income of the farm. Because of this it is urged that more live stock be kept, provided that the area under fodder crops is intensively cultivated so that the factors of production can be utilized to their fullest extent.

Handbook on grain and feeding stuff drying, D. Meyer (*Handbuch der Futtermittel und Getreidetrocknung. Leipsic, 1912, pp. XII+294, pls. 5, figs. 111*).—This describes the process, machinery, and other equipment required for drying grain, grass, clover, serradella, lupines, acorns, horse chestnuts, brewers' grains, yeast, distillery slop, and refuse from products of starch factories. The composition, digestibility, and other matters relating to the value of these materials as feeding stuffs are discussed.

Silage from turnip leaves, O. T. Bjanes (*Norsk Landmandsblad, 31 (1912), No. 34, pp. 451, 452, figs. 2*).—Turnip-leaf silage, according to the author's experience, makes an excellent dairy feed when fed about 20 to 25 lbs. daily in connection with dry roughage and grain feeds. In order to obtain a good quality of silage it is important to ensile the leaves as soon as possible after the cutting, while they are still green and succulent. A small stack silo is described for making silage.

Feeding stuff inspection (*Maine Sta. Off. Insp. 38, pp. 25–72*).—Analyses are reported of cotton-seed meal, cotton-seed feed, gluten feed, linseed meal,

distillers' grains, red dog flour, wheat middlings, wheat bran, beef scrap, and mixed feeds. There is also a list of registered feeding stuffs and their guaranteed analysis.

Commercial feeding stuffs of Pennsylvania in 1911, J. W. Kellogg et al. (*Penn. Dept. Agr. Bul. 223, 1912, pp. 171*).—Analyses are reported of cotton-seed meal; linseed meal; corn oil meal; distillers' grains; brewers' grains; malt sprouts; gluten feed; hominy feed; corn bran; corn flour; wheat, rye, and buckwheat middlings; wheat, rye, and animal by-products; wheat bran; wheat and rye offals; buckwheat feed; alfalfa meal; beet pulp; calf meals; and mixed, proprietary, condimental, and miscellaneous feeds.

Feeding stuffs, R. H. Carter and S. J. M. Auld (*Jour. Southeast. Agr. Col. Wye, 1911, No. 20, pp. 261–263*).—Analyses are reported of a mixed cake, linseed cake, undecorticated cotton cake, rape nibs, Niger seed cake, meal, cod liver oil condiment, and molasses food.

Condimental stock foods (*Amer. Food Jour., 7 (1912), No. 8, pp. 16, 17*).—An editorial which contains a discussion of the significance of the recent decision of the U. S. Supreme Court whereby States are authorized to enact and enforce laws relating to condimental stock feeds, and to charge a fee for their inspection.

Analyses of some fats of the American buffalo (bison), A. H. Schmidt (*Jour. Indus. and Engin. Chem., 4 (1912), No. 8, p. 592*).—Analyses are reported of the fat of steers and of American bison, taken from different parts of the body.

The chief difference was in the kidney fats, the chemical constants of which are as follows: Buffalo, specific gravity 0.9346, free fatty acids 1.65 per cent, titer 52.2° C., iodin number 29.45, saponification number 199.3; steer, specific gravity 0.933, free fatty acids 0.6 per cent, titer 42.85° C., iodin number 48.86, and saponification number 196. The differences are thought by the author to be due to the difference in size of the kidneys, which in the bison are about one-half the size of the cattle kidneys.

On the normal presence of manganese in animals, G. Bertrand and F. Medigreceanu (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), Nos. 15, pp. 941–943; 22, pp. 1450–1452; Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 15 (1912), Sect. VII, p. 35*).—Traces of manganese were found in about 60 species of wild and domesticated animals, and it is therefore thought that its presence has some physiological significance and is not merely accidental, as is commonly supposed.

The enzmys of the ovaries, W. Löb and S. Gutmann (*Biochem. Ztschr., 41 (1912), No. 6, pp. 445–460; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 598, II, p. 783*).—Catalase, diastase, lecithase, lipase, urease, nuclease, and proteolytic ferments of the trypsin and pepsin type were found in the ovaries of pigs. Peroxidase, invertase, lactase, glycolytic enzyms, desamidase, and tyrosinase were not detected.

The behavior of fat-soluble dyes and stained fat in the animal organism, L. B. Mendel and Amy L. Daniels (*Jour. Biol. Chem., 13 (1912), No. 1, pp. 71–95*).—The work of other investigators on this topic is reviewed and experiments in feeding dyes to rats, cats, guinea pigs, pigeons, hens, frogs, a cow, and a goat are reported. The dyes used were Sudan III, Biebrich scarlet, indophenol, oil-soluble green, oil orange, blue base, Dandelion Brand butter color, and annatto.

The results, which in general are comparable to those previously noted from other sources, are summarized as follows: "Some of the fat-soluble dyes, introduced into the organism by various paths, are deposited in the adipose

tissues and bone marrow. The renal and nervous tissues are free from the stain, even when the fatty tissues are deeply colored. Muscle probably does not take up the dye. It is seldom found in the liver, because the fat-soluble dyes, which are insoluble in water, dissolve readily in the bile and are excreted thereby into the intestine from which they can be reabsorbed.

"The fat-soluble dyes may enter the organism from the alimentary tract through the lymphatics, in solution in fat; or by the portal circulation, dissolved in reabsorbed bile. They do not pass beyond the liver unless fat is present to transport them. Then they may be found in the blood, which is rarely free from the dye in a normally fed animal that has once been stained. A cycle between intestine, bile, and blood becomes established. No elimination of the dyes occurs through the kidneys, except when an alimentary lipuria arises (in rabbits and rats).

"Contrary to the assertion of others, the stained fat is no less available to the organism than the unstained. In cases conducive to fat transport—in starvation, phosphorus and phlorhizin poisoning—stained fat migrates from the stained depots to the blood and the liver cells. Here the dye is separated and secreted into the bile, so that the liver, though having a high content of fat, may be free from the dye. Stained fat does not traverse the placenta. The blood of the fetus and the fat of young born of Sudan-stained mothers are free from dye.

"The excretion of Sudan III and Biebrich scarlet in milk, when they are given with food fat, suggests that the latter may pass directly into the mammary secretion. With cats and rats the results are striking, but the dye excretion in milk ceases when the stained food is no longer fed. In guinea pigs and goats the secretion of dye in the milk is positive; in the cow it has not yet been demonstrated. The variation in the outcome in the different species may be due to variations in the relative abundance in the dietaries of fat necessary for the absorption and transport of the dye. This explanation is emphasized by the observation that those animals (cats, rats, hens, pigeons) for which fat enters more largely into the diet, become stained more easily or speedily than animals which are accustomed to ingest relatively smaller amounts of fat."

The misuse of the term "melanin," R. A. GORTNER (*Science, n. ser., 36 (1912), No. 915, pp, 52, 53*).—The author suggests that we substitute for melanin and melanin nitrogen of protein hydrolysis the terms proposed by Osborne, humin or humin nitrogen, and reserve the term melanin for those dark pigments which occur normally or pathologically in the animal body, skin, hair, or feathers.

The case of generalized melanosis in fowls, LEWIN (*Ztschr. Veterinärk., 22 (1910), No. 10, pp. 455, 456; abs. in Berlin. Tierärtzl. Wchnschr., 28 (1912), No. 31, p. 567*).—A brief description of a cock in which melanotic pigment was present in the muscles, bones, and other internal tissue as well as in epidermal structures.

The present status of the genetics problem, W. J. SPILLMAN (*Science, n. ser., 35 (1912), No. 907, pp. 757–767*).—The author briefly discusses some of the principal results which have been accomplished by the different methods of studying heredity. Some suggestions for future work are offered.

Negative results of in-and-in breeding among wild animals, W. T. HORNADAY (*Proc. Internat. Zool. Cong., 7 (1907), pp. 162–164*).—The author believes that the evil effects supposed to be due to in-and-in breeding when practiced among domesticated animals do not occur in the case of wild animals, provided they are given free range, proper protection, and abundant food. These

views are based on the results accomplished in 45 years' breeding of red deer in New Zealand and 15 years' breeding of fallow deer on the Island of Lambay.

Live-stock breeding in Hungary, J. ROSTAFINSKI (*Die Tierzucht Ungarns. Vienna and Leipsic, 1912, pp. IX+178, pls. 40, figs. 56; abs. in Österr. Molk. Ztg., 19 (1912), No. 16, p. 249*).—A treatise which discusses the conditions of the live-stock industry in Hungary and describes methods of breeding, feeding, and managing horses, cattle, sheep, and swine.

Statistical data on our European meat trade, J. E. RICHELET (*Bol. Min. Agr. [Buenos Aires], 14 (1912), No. 2, pp. 167–197*).—This contains data on the production and export of meat from Argentina.

The origin and use of the herd book, with special reference to cow-testing associations and judging live stock, W. LÜKEN (*Kühn Arch., 1 (1911), pt. 2, pp. 253–319*).—This article discusses the substantial features of herd books as a means for improving live stock. Detailed measurements are also given of zebus, yaks, gayals, and bantengs, and of crosses of zebus and gayals with common breeds of cattle.

Native and grade cattle breeding, J. M. SCOTT (*Florida Sta. Bul. 110, pp. 59–72, figs. 9*).—Native cows were bred to Hereford, Shorthorn, and native bulls and kept on the same range until the calves were weaned. After weaning time the calves were all kept on the same pasture in summer, but in the winter were given the range of a velvet-bean and Japanese-cane field. The average birth weights were as follows: Five grade Herefords, 47.9 lbs.; 4 grade Shorthorns, 56 lbs.; and 3 natives, 48.6 lbs. At weaning time, when the calves were 7½ months old, the weights were for the grade Herefords 351.6 lbs., grade Shorthorns 342.5 lbs., and natives 305 lbs. The average weights of 2 animals in each lot at 1 year of age were, grade Herefords 405 lbs. and grade Shorthorns and natives 447.5 lbs.

When weighing about 700 lbs. these 6 animals were put in a small yard and fed for 90 days a ration of shelled corn, cotton-seed meal, and Japanese cane. The average daily gains per head and day were 1.25 lbs. for the grade Herefords, 1.89 lbs. for the grade Shorthorns, and 1.78 lbs. for the natives.

The author discusses beef production in Florida and advocates better winter feeding of native cattle and the selling of calves at weaning time.

The organization of cattle breeding in Kamerun (*Deut. Kolon. Bl., 33 (1912), No. 6, pp. 253–260; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 6, pp. 1366, 1367*).—An account of breeding operations by the German government in introducing zebus and the Allgau breed to cross with the native cattle of Kamerun.

Investigations on the rutting of cattle, E. WEBER (*Untersuchungen über die Brunst des Rindes. Abhandl., K. Sächs. Tierärztl. Hochsch. Dresden, 1911, pp. 67*).—Previously noted from another source (E. S. R., 26, p. 367).

Cattle feeding, W. HAWK (*Cornwall County Council Agr. Expts. 1911, pp. 1–46*).—In a feeding test with 15 steers the addition of 28 lbs. of mangels to a daily ration of 2 lbs. decorticated cotton-seed cake, 2 lbs. corn meal, and second-rate hay increased the daily gains per head from 1.25 lbs. to 1.83 lbs., and the addition of 56 lbs. of mangels increased the daily gains to 1.86 lbs. Two steers fed mangels and good hay ad libitum, with 6 lbs. corn meal, gained 1.61 lbs. each daily for 2 months against 1.45 lbs. for 4 steers on good pasture and hay ad libitum with 6 lbs. corn meal. Anaylses are given of a large number of samples of mangels.

Four heifers fed daily 2 lbs. soy-bean cake, 2 lbs. undecorticated cotton-seed cake, and 2 lbs. corn meal each gained 2.64 lbs. per head and day for 18 weeks against corresponding gains of 2.46 lbs. for 3 heifers fed 3 lbs. linseed meal and 3 lbs. decorticated cotton-seed cake. Three heifers fed 3 lbs. soy-bean cake and

3 lbs. undecorticated cotton-seed cake gained 2.5 lbs. per head and day for 18 weeks against a corresponding gain of 2.54 lbs. for 3 heifers fed 6 lbs. linseed meal. It is stated as a result of feeding experiments with young cattle that if they could be kept in a thriving instead of a stationary condition all winter the percentage of deaths during the spring would be enormously diminished.

[Dried beet pulp for fattening cattle], J. MACKINTOSH (*Jour. Southeast. Agr. Col. Wye, 1911, No. 20, pp. 31–38*).—In tests with steers 1 lb. of beet slices was found to be equivalent to about 8 lbs. of mangels, but it is stated that it is inadvisable to feed more than 7 lbs. of the pulp per head per day.

Fattening calves in Alabama, D. T. GRAY and W. F. WARD (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 147, pp. 40, pls. 3*).—The data reported in this bulletin have been previously abstracted from another source (E. S. R., 27, p. 372).

Sheep feeding and farm management, D. H. DOANE (*Boston, New York, and London, 1912, pp. XII+128, pls. 2, figs. 38*).—A practical work on modern and profitable methods for buying, feeding, and marketing sheep, based on a study of actual farm practices on farms in different sections of the United States.

Horse breeding in Tunis, P. DIFFLOTH (*Vie Agr. et Rurale, 2 (1912). No. 8, pp. 193–197; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 4, pp. 967, 968*).—This discusses the measures by which horses have been improved in Tunis since the French occupation in 1881.

Investigations into the growth of the hoof of horses, C. SCHULZE (*Monatsh. Prakt. Tierheilk., 22 (1912), No. 1–2, pp. 64–85; abs. in Deut. Landw. Presse, 39 (1912), No. 7, pp. 67, 68; Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 3, pp. 734, 735*).—The following results were obtained as a result of measuring the growth on 800 hoofs:

"The growth of the wall of the hoof averages 7.66 mm. per month. Unshod hoofs grow 8.6 mm. on the average per month, and shod hoofs only 6.73 mm. . . .

"The fore and hind hoofs grow at about the same rate, but the rate of growth of the different hoofs is seldom quite uniform. The hoof growth around the coronet is uniform in 90.6 per cent of all hoofs and irregular in 9.4 per cent. Irregular growth rarely occurs with regular shapes of hoof.

"When unshod hoofs are shod, there is an arrest of growth. Good care of the hoofs and good shoeing, especially that method of shoeing by which the hoof approximates more to natural conditions (seated shoes and half shoes), may reduce this injurious effect.

"The hoofs of horses aged from 5 to 10 years have on the average a monthly growth of 0.29 mm. faster than the hoofs of horses aged from 11 to 19.

"The color of the hoof has no relationship to its rate of growth. The duration or kind of work does not affect the rapidity of hoof growth to any ascertainable extent.

"In foundered hoofs the heel grows more rapidly than the toe and quarters. In hoofs shod with bar shoes the toes grow from 2 to 5 mm. more per month than the remaining wall sections. Injuries to the hoof coronet give rise to an additional growth up to 7 mm. per month in the corresponding part of the wall.

"Single dressings with cantharis ointment or cauterization of points on the coronet usually result in an increased growth of 3 mm. in the wall in the month following. A better result is obtained by frequently repeated dressings with ointment, but there is no specific capable of permanently increasing the horn production.

"Hoofs in which the volar or plantar nerves are severed grow on the average 2.5 mm. per month more than sound hoofs.

"General diseases as a rule lead to no arrest of hoof growth; indeed there is often an enhanced growth after recovery from a disease. The hoof horn, however, becomes dull when the animal is ill and shows a deficiency in moisture and elasticity."

Contribution to the study of the dentition of the Equidæ, A. VEITH (*Arch. Naturgesch., 78 (1912), Abt. A, No. 5, pp. 1–33, pls. 2*).—A discussion of the character and succession of teeth in horses, zebras, and extinct equine types.

Ostriches [and stallions] from the Sudan (*Agr. Jour. Union So. Africa, 3 (1912), No. 6, pp. 807–813*).—A brief report of an expedition sent by the Union Government of South Africa to secure, if possible, some ostriches from the northern sections of the continent, where there is believed to be a special type from which the best feather producers of the South African birds have descended.

The feathers which could be obtained from birds east of Lake Chad were very thin, much like the feathers of the wild birds of South Africa. In northern Nigeria 140 birds were obtained and taken to Cape Town. The peculiarities of these birds were dense, healthy, short feathers, red skins, bald heads, and eggs larger than the South African ostriches, but unpocketed and a thin shell.

There is a note concerning 2 Asben stallions obtained from the Tuarek tribe, a breed which is considered by these people to be superior to the Arabian horses and which has been kept pure for many centuries.

Poultry keeping as an industry for farmers and cottagers, E. BROWN (*London, 1912, 8. ed., pp. VI+206, pl. 1, figs. 110*).—Some of the chapters in this book have been rewritten since the last edition, and much new matter has been incorporated embodying the more recent results of practical experience in poultry keeping.

Fleshing chickens for market, W. A. WILSON (*Saskatchewan Dept. Agr. Bul. 25, 1911, pp. 29, figs. 15; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 3, pp. 742, 743*).—The average cost of fattening poultry in experiments carried out in the years 1907 to 1910 was 5.98 cts. per pound dressed weight, and the selling price 18.74 cts. per pound dressed weight. The average dressed weight per bird was 3.23 lbs. The methods of feeding are given.

A new process of preserving eggs (*Sci. Amer. Sup., 74 (1912), No. 1909, p. 76, figs. 4*).—This describes the process invented by M. Lescardé in which the eggs are placed in a specially constructed metal box and carbon-dioxid and nitrogen gas used as sterilizing agents.

"When the box is filled with eggs, a small amount of chlorid of calcium is put in to absorb the greater part of the moisture of the air, and then the cover is soldered on, leaving a small hole in the top for the circulation of air or gas. The boxes are then ready to be taken to the sterilizer, which consists of a large cylindrical tank. . . . The boxes are stacked upon roller trucks, which are then run upon rails to the tank, a considerable number being treated at a time. The cylinder has a tight closing door, and resembles an injecting cylinder for treating railroad ties. The tank is first of all exhausted to extract the gases or air from the air pocket of the eggs and also the gases dissolved in the albumin. After this has been done, carbonic-acid gas is sent into the apparatus from steel bottles containing compressed or liquefied gas. As the gas which leaves the bottles becomes very cold owing to its expansion it is warmed somewhat to prevent cracking of the eggshells. For this purpose the gas is run through a worm tube placed in a tank of warm water. The pressure in the tank is observed by means of a gauge. After admitting a certain amount, the gas is shut off for a time, while it continues to be absorbed by the albumin of the eggs. Fresh gas is then let in when the pressure is seen to fall, and

this is kept up until the eggs absorb no more gas. When the proper point in this operation is reached the carbonic-acid gas is shut off, and a portion of it is then again extracted by pumping, to be replaced by a certain amount of nitrogen fed from compressed gas cylinders. The eggs are then ready to be removed from the tank, and the trucks are rolled out, after which the workmen solder up the small inlet opening. As the pressure in the box is above atmospheric, there is no danger of air leaking in."

The Canada grouse (Dendragapus canadensis) in captivity; its food, habits, etc., W. L. BISHOP (*Proc. and Trans. Nova Scotian Inst. Sci., 13 (1911–12), No. 2, pp. 150–153*).—This account is based on several years' experience in keeping Canada grouse or "spruce partridge" in an inclosure.

International Association of Instructors and Investigators in Poultry Husbandry (*Proc. Internat. Assoc. Instr. and Invest. Poultry Husbandry, 1 (1908–1910), pp. 164, pls. 4, figs. 5*).—This contains the proceedings of the association for 1908, 1909, and 1910. The following are among the more important papers which have not been previously noted from other sources: The Field of Research in Poultry Husbandry, by H. Atwood; The Present Status of Investigation of the Problems of Poultry Culture, by P. B. Hadley; Profitable Lines of Investigation in Poultry Diseases, by G. B. Morse; Present Condition of Experimental Work in Feeding, by R. R. Slocum; Comparison of Poultry Keeping in Europe, United States, and Canada, by W. Brown; An Outline for a Course of Study in Poultry Husbandry, by J. E. Rice; Study of Feeds and Methods of Instruction in Feeding, by W. G. Krum; Instruction in Feeding Poultry, by C. A. Rogers; Poultry Pathology, Its Place in the Curriculum, by G. B. Morse; Teaching by Farm Trains and Educational Exhibits at Fairs, by W. A. Brown; and Teaching by Lectures, Recitations, and Reference Reading, by W. A. Lippincott. Appended is a bibliography of about 1,000 titles.

DAIRY FARMING—DAIRYING.

The relation between form and function in dairy cattle and the outer milk signs of cows, W. GAUDE (*Arb. Deut. Gesell. Züchtungsk., 1911, No. 7, pp. X+799, tables 18*).—The author reports measurements and other data concerning 715 dairy cows in tabular form. The conclusion is drawn that external measurements do not furnish a guide to the milk-producing capacity of the dairy cow, but, as Rodewald has shown for the data reported by Schmidt and Kronacher (E. S. R., 21, p. 778), this finding may be due to the method of tabulation employed by the author.

Conformation and milk production (*Österr. Molk. Ztg., 19 (1912), No. 1, pp. 1, 2*).—A discussion of the views of Gaude, noted above, and others who have written on the subject of correlation between form and function of dairy cows.

[The relation between conformation and milk production], J. H. W. T. REIMERS (*Cultura, 24 (1912), Nos. 281, pp. 21–34; 282, pp. 78–91; 283, pp. 113–121; 284, pp. 144–157; 285, pp. 184–194*).—Measurements of dairy cows are given, and the correlation between form and function is discussed.

Progress made in the improvement of the Norrland mountain breed of cattle during the last two decades, E. O. ARENANDER (*K. Landtbr. Akad. Handl. och Tidskr., 51 (1912), No. 5, pp. 336–361, figs. 11*).—This is a discussion of the various agencies that have been brought to bear on the recent improvement of this Swedish breed, and the yields of 3 herds during 1904–1908 are given as an illustration of the progress made. One of these increased in production from 2,409.6 to 2,597.4 kg. of milk per head, and from 93.19 to 118.97 kg. butter fat, the average Swedish feed units (each equal to 2 Danish

feed units) eaten in 1904 being 1.244, and in 1908 1.367. A similar increased production was obtained in other herds. The maximum yield of a cow for the year in these herds was 4,195 kg. milk, containing 165.53 kg. fat; the feed units eaten, 1,800. The increase in production has come through systematic breeding, by the use of pure-bred bulls of proved dairy capacity, and through improved methods of feeding and caring for the cattle. In the author's opinion the old Swedish mountain breed is splendidly adapted to, and in some ways is unexcelled for, Norrland, and should be retained and further improved.

Experiments in milking cows two and three times a day, N. O. HOFMAN-BANG ET AL. (*Ber. K. Vet. og Landbohöjskoles Lab. Landökonom. Forsög [Copenhagen], 78 (1912), pp. 50*).—In milking trials on 4 different estates, involving 172 cows that averaged from 13 to 14 kg. of milk per day, milking 3 times a day produced an average increase of 0.8 kg. per head and day. The fat content was not appreciably affected, but where the cows were not fed heavily there was a slight loss in body weight. These trials did not furnish any evidence as to the possible influence that frequent milking of heifers might have on the development of the milking capacity of the mature cow.

Prees cottagers' cow club (*Jour. Bd. Agr. [London], 19 (1912), No. 5, pp. 388–392*).—A society composed of owners of small farms in Shropshire, England, who have since 1838 run a successful system of live-stock insurance, under which the members in return for a payment of 4s. 2d. per cow per annum receive the value up to £12 for every insured cow that dies of disease or accident. A reserve fund of £1,040 has accumulated, which secures them against having to meet heavy losses.

The dairy industry in western Siberia and the possibilities of its extension, HOLLMANN (*Mitt. Deut. Landw. Gesell., 27 (1912), Nos. 12, pp. 182–186; 13, pp. 197, 198; 14, pp. 211–214; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 6, pp. 1428–1431*).—A general statistical account of the development of the dairy industry in Siberia since the first dairy was established at Kurgan in 1894.

Journal of the British Dairy Farmers' Association, 1912 (*Jour. Brit. Dairy Farmers' Assoc., 26 (1912), pp. 288, figs. 16*).—This contains reports of the International Dairy Congress at Stockholm, 1911, the dairy show of the British Farmers' Association, 1911, milk trials and butter tests, and other matters relating to the dairy industry in Great Britain. Among the papers on special topics are the following: The Dairy Industry in the Netherlands, by J. J. L. Van Rijn; Milk Records, by J. Mesdag; Fighting Contagious Diseases of Animals in the Netherlands, by J. Poels; Cooperative Bacon Curing, by L. M. Douglas; The Letting of Dairies, a West Country Custom, by J. H. Burton; The Dairy Conference in Holland, by F. J. Lloyd; and Rearing and Preparing Poultry for Market, by S. C. Sharpe.

Report of the dairy and cold-storage commissioner, J. A. RUDDICK ET AL. (*Rpt. Dairy and Cold Storage Comr. Canada, 1912, pp. 150, pls. 6*).—This contains records of dairy herds, data on the cost of milk production, trade in milk and milk products, the temperature of creamery butter at shipping stations, cow testing associations, and brief reports on care and handling of cream for butter making.

Report on the activities of the dairy institute at Proskau, KLEIN (*Ber. Milchw. Inst. Proskau, 1911–12, pp. 17*).—This reports analyses of milk, trials of dairy apparatus, and other work on related topics.

The cost of milk production in Hungary, E. KOERFER (*Indus. Lait. [Paris], 37 (1912), No. 35, pp. 594–598*).—Figures are given showing the mean annual cost of milk production in Hungary from cows producing an average of 6 liters of milk daily to be 14.57 fillers per liter (about 3 cts. per quart).

The milk supply of Genoa, E. Bertarelli (*Chacaras e Quintacs, 5 (1912), No. 2, pp. 4–9; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 4, pp. 1014, 1015*).—Since the formation of an association of the milk producers that send milk to Genoa the quality of the milk has improved and the consumption greatly increased. The retail price is about 31 cts. per gallon, and the expense per gallon as follows: Cost of milk 16.4 cts., freight to Genoa 1.7 cts., cartage from railway to town 0.9 ct., town duty 3.5 cts., handling and storing at Genoa 1.7 cts., sale and general expense 3.5 cts., and return of empties 0.9 ct.

Studies of pure milk, C. Granvigne and G. Cassez (*Separate from Compt. Rend. Assoc. Franç. Adv. Sci., 1911, pp. 14*).—Analyses are reported of mixed milks and butter made from samples thereof.

The factors affecting the fat content of milk, A. Mallèvre (*Bul. Soc. Sci. Hyg. Aliment., 1 (1911), No. 1–2, pp. 52–62*).—A general discussion of the influence of breed, feed, and other factors which affect the percentage of fat in milk.

Changes in the composition of the milk of the cow on different diets, K. Helle et al. (*Ztschr. Biol., 58 (1912), No. 8–11, pp. 355–374; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 598, II, p. 786*).—The effect of various diets on the composition of milk was slight. The protein, sugar, and ash remained very constant. The amount of fat, solids-not-fat, and the fuel value varied more or less from day to day. Data are also reported on the specific gravity of the milk, the specific gravity of the serum, freezing point, osmotic pressure, refraction of the serum, and electrical conductivity.

The iron content of goat's milk, M. Stafford (*Ztschr. Kinderheilk., Orig., 4 (1912), No. 2, pp. 168–170; abs. in Zentbl. Expt. Med., 2 (1912), No. 4, p. 149*).—The author found from 1.27 to 2.63 mg. of iron in 1 liter of goat's milk.

Arsenic in milk, I. McCrae (*Agr. Jour. Union So. Africa, 3 (1912), No. 6, pp. 842, 843*).—Samples of milk were taken from cows which had been habituated to a weekly arsenical dip for many years.

By the Reinsch process, which is capable of detecting 0.0001 grain of arsenic, no indication of the presence of this element could be obtained when working on 100 cc. Arsenic was present in some samples, as indicated by the Marsh process, but there could not have been enough in any case to have any toxic effect. Other samples were entirely free from arsenic. This indicates that the arsenic is not absorbed by the animal and secreted in the milk, and wherever traces of arsenic have been present it has probably been due to accidental contamination during the process of milking.

It was found that distilled water free from arsenic, after standing in a new washed glass bottle for 14 days, absorbed from the glass enough arsenic to be revealed by the Marsh test. Therefore, the danger to the consumer from milk may be less when cows are dipped in arsenical solutions than when milk is kept in glass bottles, but both dangers are considered negligible.

Preservation of milk samples for analysis [with potassium bichromate], X. Rocques (*Ann. Falsif., 5 (1912), No. 45, pp. 338–342; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 15, p. 742*).—Studies of milk samples preserved with potassium bichromate in accordance with the French law (1 gm. per liter of milk) showed the necessity of adding the bichromate to the milk as soon as possible, because of the marked reducing action of lactic acid. If changes have already taken place before the bichromate is added, analysis should be performed as soon as possible. After keeping for some time lactic acid entirely reduces the bichromate present and so destroys the antiseptic action.

Shall we abandon fresh milk? R. E. Wood (*Amer. Food Jour., 7 (1912), No. 8, pp. 1–4, figs. 3*).—This discusses the value of pasteurizing and inspection of milk as safeguards against milk-borne epidemics of disease. Sterilized and evaporated milk delivered to the consumer in hermetically sealed packages is advocated as the only milk for those who seek an absolutely hygienic product.

Market milk regulation (*N. Y. Produce Rev. and Amer. Cream., 34 (1912), No. 7, pp. 330–333*).—This gives a classification of milk and cream, definitions of bacteriological and chemical standards, and rules for producing, handling, and distributing milk, suggested by the New York Milk Committee.

That milk control, J. H. Monrad (*N. Y. Produce Rev. and Amer. Cream., 34 (1912), No. 12, p. 556*).—A criticism of the recommendations of the New York Milk Committee, noted above.

Milk control regulations, C. E. North (*N. Y. Produce Rev. and Amer. Cream., 34 (1912), No. 19, pp. 816, 817*).—A discussion of the report of the milk commission, noted above.

A lawyer's views on milk standards and regulations, W. J. Carlin (*Cream. and Milk Plant Mo., 1 (1912), No. 1, pp. 9–11*).—The author suggests efficient state inspection of dairies as a solution of the difficulties connected with milk inspection, and states that reasonableness is the test by which standards and regulations must eventually stand or fall.

Milk and cream regulations (*Brit. Food Jour., 14 (1912), No. 164, pp. 146–149*).—These regulations of the Local Government Board of England and Wales, issued in 1912, prohibit the use of preservatives in market milk or the addition of any thickening substance to cream. Boric acid, borax, or hydrogen peroxid may be added to cream containing more than 35 per cent fat under certain restrictions.

The score-card system of dairy inspection, G. M. Whitaker (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 199, pp. 32*).—A revision of Circular 139, previously noted (E. S. R., 20, p. 1073).

A simple butter color standard, S. H. Ayers (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 200, pp. 3, fig. 1*).—This circular advocates as a standard for comparing color for butter fat the use of a graduated series of solutions of bichromate of potash of varying strength, so arranged as to give a range of color from a light to a dark yellow. Each shade is given a numerical value. The method of using the standard is given in detail.

In regard to the consistency of the cheese mass during the manufacture of Edam cheese, W. Van Dam (*Centbl. Bakt. [etc.], 2. Abt., 32 (1911). No. 1–2, pp. 7–40, figs. 3; Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefstat. [Netherlands], 1911, No. 10, pp. 5–49, figs. 3; Rev. Gén. Lait, 9 (1912). Nos. 3, pp. 56–63; 4, pp. 73–80, figs. 3; 5, pp. 103–110; 6, pp. 131–139; 7, pp. 151–158*).—Continuing previous work (E. S. R., 23, p. 212), the author now points out that the digestion of casein is not the only factor upon which the typical structure of Edam and other cheeses depends. This work was conducted for the purpose of studying the following points: (1) The fixation of lactic acid by casein; (2) the relation which the structure of the cheese has to the acidity and the sodium chlorid concentration; and (3) the neutralizing capacity of the bodies which are precipitated from milk by rennet.

By physico-chemical methods it was determined that lactic acid was capable of fixing a certain amount of casein (4.25 per cent of its weight). The casein lactate thus formed was very easily hydrolyzed by water. The fixing of this amount of lactic acid, according to the author, gives a full explanation for the small amounts of lactic acid found in Edam cheeses in the work previously reported. No reason, therefore, exists for differentiating between calcium

monolactate and bilactate, and the results obtained point to the view that a calcium phosphocaseinate exists in milk in solution. It was further noted that the greater or lesser swelling of the cheese mass, upon mixing with lactic acid and 5 per cent of sodium chlorid, is a function of the hydrogen ion concentration. This fault in cheese making may, therefore, be said to be due to insufficient swelling of the calcium lactocaseinate under the influence of the sodium chlorid and hydrogen ions.

Tests were also conducted to determine the influence of the concentration of the sodium chlorid of the cheese moisture upon the swelling of the cheese mass. The maximal swelling was found to set in at the concentration of ± 5 per cent, which is found in practice to be the normal. At a lower or higher concentration the rate of swelling decreases. The curves obtained in this work also explain the formation of the so-called salty crust of Edam cheese. In a concentration of from 10 to 15 per cent of sodium chlorid in the cheese moisture no swelling of the casein takes place. This phenomenon is a colloidal-chemical and not a bacteriological one. The formation of heavy crusts in cheeses can also be explained in the light of colloid chemistry (Gels). In caseifying certain milks it was noted that the acidity of the cheese mass as noted had no relation to the neutralizing properties of the substances precipitated by rennet. The production of short cheeses from calcium-poor milks has no relation to the lesser neutralizing property of such milks, but they are a factor in so far that they have a tendency to retain too much whey, and this results in the production of a sour cheese. Milk sugar is also a factor in this case.

Some tests are also included which deal with the factors which influence the moisture content of the cheese mass. These will be reported upon at a later date. The results of some experiments are given which tend to set aside the conception that the peptonization of casein is not due to bacterial action.

On the consistency of the cheese mass, F. W. J. Boekhout and J. J. Ott de Vries (*Centbl. Bakt.* [*etc.*], *2. Abt., 33 (1912), No. 25, pp. 609–617, fig. 1*).—A critical discussion of the article noted above.

Brinsen cheese, Winkler (*Österr. Molk. Ztg., 19 (1912), No. 16, pp. 241–243, figs. 5*).—The different methods of making Brinsen cheese are described.

White Gorgonzola cheese, trans. by J. H. Monrad (*N. Y. Produce Rev. and Amer. Cream., 34 (1912), No. 18, p. 793*).—The contrasts between the methods of making white and green Gorgonzola cheese are pointed out.

VETERINARY MEDICINE.

Special pathology and therapeutics of the diseases of domestic animals, F. Hutyra and J. Marek, edited by J. R. Mohler and A. Eichhorn (*Chicago, 1912, vol. 1, pp. XVI+1133, pls. 10, figs. 198*).—An authorized American edition translated from the third revised and enlarged German edition (E. S. R., 26, p. 82).

A manual of veterinary physiology, F. Smith (*London, 1912, 4. ed., pp. XII+808, pl. 1, figs. 260*).—A fourth revised and enlarged edition of this work.

Compendium of practical toxicology, R. Kobert (*Kompendium der Praktischen Toxikologie. Stuttgart, 1912, 5. ed., rev. and enl., pp. XII+328*).—This is the fifth edition of this well-known work which has been entirely rewritten and enlarged. It is meant for physicians, health officers, and students.

In regard to the theory of disinfection, R. Betzel (*Zur Theorie der Desinfektion. Diss. Tech. Hochsch. Karlsruhe, 1911, pp. 64*).—The adsorption of chloroform, silver nitrate, corrosive sublimate, formaldehyde, and phenol at various concentrations by yeast was studied. It was noted that the process of taking up the disinfectant was an adsorption phenomenon. The disinfecting

property of phenol is no simple function of the amount of disinfecting agent taken up by the yeast.

Antitoxin and protein, P. H. RÖMER (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 13 (1912), No. 3, pp. 260–282*).—The milk from sheep which were previously injected with tetanus antitoxic serum from the horse contained antitoxin. Horse serum protein could not be detected with certainty with the aid of the complement fixation and precipitation methods. The serum of sheep which were treated by various methods with tetanus antitoxin obtained from the horse showed the presence of this antitoxin for a period of six months thereafter, while the substances which can be precipitated by antiserum vanished long before this period.

About neosalvarsan, E. SCHREIBER (*München. Med. Wchnschr., 59 (1912), No. 17, pp. 905–907; abs. in Centbl. Bakt. [etc.], 1. Abt., Ref., 54 (1912), No. 3, pp. 82, 83*).—Neosalvarsan is a monobody which results from the condensation of sodium formaldehyde-sulphoxylate with salvarsan. It is easily and neutrally soluble in water. According to Ehrlich it is more toxic to the trypanosomes than salvarsan, about 1 gm. being as toxic as 1.5 gm. of salvarsan. The main thesis of this work was in regard to spirochete infections (lues) in man.

The action of salvarsan on anthrax, SCHUSTER (*Abs. in Ann. Méd. Vét., 61 (1912), No. 6, p. 342*).—Experiments show that salvarsan exerts a specific action on the anthrax bacillus. When an injection of salvarsan was made simultaneously with the inoculation of a virulent culture of the anthrax bacillus no signs of the disease appeared. Recovery resulted when the injection of salvarsan was made from 1 to 12 hours after the rabbit was experimentally infected.

Contribution to our knowledge of the precipitin reaction as an aid for diagnosing anthrax, PROFÉ (*Centbl. Bakt. [etc.], 1. Abt., Orig., 64 (1912), Festschrift F. Loeffler, pp. 185–189*).—The author sought to determine in what way the method and time of heating the anthrax material influenced the results obtained with the precipitin reaction. Repeated boiling of the material from animals suffering from anthrax in an aqueous or saline solution over the direct flame has no more effect upon the precipitinogen than keeping it in boiling water from 5 to 45 minutes.

The chloroform precipitation method (E. S. R., 27, p. 80) has the advantage over the heating method in that it yields clearer extracts and gives a sharper reaction. A modification of the chloroform method is given.

Report of the departmental committee appointed by the president of the Board of Agriculture and Fisheries to inquire into foot-and-mouth disease (*Rpt. Dept. Com. Bd. Agr. and Fisheries [Gt. Britain], Foot-and-Mouth Disease, 1912, pts. 1, pp. 12; 2, pp. III+337*).—This is the report of a committee of 12 appointed November 17, 1911, to inquire into the recent outbreaks of foot-and-mouth disease in England and to consider measures to prevent their recurrence. The committee also extended its inquiry to anthrax, since any measures as to imports which would be preventive of anthrax would also be effective against foot-and-mouth disease. The report takes up the history of foot-and-mouth disease in Great Britain, gives a description of it, and discusses experiments and research into foot-and-mouth and other diseases, preventive inoculation and experimentation with virus of a dangerous nature in Great Britain, origin of outbreaks, means by which the virus may be imported, etc.

The committee are of the opinion that all persons employed as knackers or slaughterers, as well as all owners of stock, should be required to report immediately any observed case of the disease. If hides and skins from infected countries are sterilized prior to shipment there will be no necessity for

cleansing and disinfecting holds of ships, trucks, and freight cars in or on which they have been carried. The sweepings of holds of ships are considered a source of danger, and it is recommended that they be destroyed or thrown overboard and not allowed to land.

The second part of this report consists of minutes of evidence and appendixes in which are presented details of outbreaks of foot-and-mouth disease in each county of Great Britain, 1870 to 1911, a translation of a paper by B. Bang on foot-and-mouth disease, and a summary of passenger traffic to the United Kingdom from Europe. An index to the evidence of the 32 witnesses is also given.

The diagnosis of glanders by the complement fixation and the agglutination test, NEVERMANN (*Berlin. Tierärztl. Wchnschr., 27 (1911), No. 52, pp. 954, 955*).—No case of glanders occurred after all animals detected with the blood tests had been removed. On the basis of blood tests 160 horses were destroyed, of which 134, or 83.7 per cent, were found to be glanderous.

The utilization of anaphylaxis for diagnosing glanders, H. MIESSNER (*Centbl. Bakt. [etc.], 1. Abt., Orig., 56 (1910), No. 5–6, pp. 537–542; abs. in Centbl. Bakt. [etc.], 1. Abt., Ref., 49 (1911), No. 6, p. 177*).—This test is considered of no value for diagnosing glanders.

Melitensis and paramelitensis, L. NÈGRE and M. RAYNAUD (*Compt. Rend. Soc. Biol. [Paris], 72 (1912), No. 18, pp. 791–793; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 5 (1912), No. 13, pp. 296, 297*).—A coccus is described which culturally and morphologically strictly resembles the *Micrococcus melitensis*, but is distinguished from it by not agglutinating with a specific Malta fever serum. The serum obtained with this organism, on the other hand, will not agglutinate the *M. melitensis*.

Contribution to the diagnosis of tuberculosis (with the sputum) with the aid of the protein test, B. NICOLA (*Riv. Ig. e Sanit. Pub., 22 (1911), No. 8, pp. 233–237; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 5 (1912), No. 2, pp. 923, 924*).—This is an investigation of the value of Roger's protein reaction.

The conclusion reached is that the test is a good one for detecting acute and chronic tuberculosis as long as the secretion is obtained from the lungs. A bronchial secretion will not give the test. Positive reactions may at times be obtained in lobular pneumonia, bronchial pneumonia, and in congestions which result from heart and kidney insufficiencies.

Action of certain glycerol esters upon the tubercle bacillus, A. T. SALIMBENI (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 5, pp. 368–370*).—In most of the tests the author utilized mono-, di-, and trichlorhydrin esters of glycerol.

In the preliminary tests it was found that mono- and dichlorhydrin dissolved the fatty material extracted with acetone from the tubercle bacillus in the cold; also a waxy substance extracted from the tubercle bacillus by chloroform, but insoluble in acetone. Trichlorhydrin ester dissolves these waxes and fats very rapidly.

As a result the author made a study of the behavior of the tubercle bacillus when treated with these esters. The trichlorhydrin ester destroyed the acid resisting powers of the tubercle bacillus and the organisms became granular and easily took the blue stains. The ester acted more strongly on the organism than either mono- or dichlorhydrin esters. A large quantity of the mass insoluble in the esters was soluble in water.

The action of certain products obtained from the tubercle bacillus, B. WHITE and O. T. AVERY (*Jour. Med. Research, 26 (1912), No. 2, pp. 317–356*).—"Tuberculo-protein treated by the method of Vaughan yields a poisonous substance (called toxophore by Vaughan), which, in suitable doses, produces in

normal guinea pigs an intoxication resembling, if not identical with, the specific immediate protein intoxication in hypersensitive pigs. The gross pathological findings appear to be similar in both conditions. The minimum fatal dose of 2 preparations was 1 part to 15,000 parts of body weight. Boiling for 1 minute with filtration does not affect the potency of the watery solution.

"Fatal doses of the poison cause an abrupt fall in temperature. Smaller amounts (up to 0.01 gm. for pigs from 200 to 250 gm.) are apparently without appreciable effect on the body temperature. Under the experimental conditions noted, repeated increasing doses of poison fail to render animals immune to a minimum fatal dose. Survival from a large intravenous dose of the poison apparently renders the animal refractory, for 48 hours at least, to an amount in excess of that required to kill. Fresh brain, lung, and liver tissue, under the conditions noted, showed no binding or neutralizing affinity for the poison. Normal guinea pig serum has little if any destructive action on the cell poison. Intradermic injections of 0.00005 gm. of the poison produced no local reactions in normal or sensitized pigs.

"Atropin sulphate protected 75 per cent of the animals from a synchronous injection of fatal amounts of poison. Morphin sulphate aborts the acute sympoms and delays death, and in 2 cases completely protected from fatal intoxication. Chloral hydrate protected many of the animals against an otherwise fatal dose of the poison, and inhibited the acute manifestations and delayed death in others. Lecithin emulsion injected simultaneously with the poison seems to possess a slight and irregular prophylactic action. Incubation of the poison with lecithin emulsion for 1 hour at 27.5° C. increases this neutralizing property. A dose of 1:12,000 of the poison was not affected. The preliminary administration of lecithin protected some of the animals, delayed death in others, and was without effect in the remainder. The results were too inconstant to warrant definite conclusions."

A bibliography embracing 17 titles is included.

Protective vaccination against tuberculosis with killed tubercle bacilli contained in reed sacks, G. HEYMANS (*Deut. Med. Wchnschr., 38 (1912), No. 23, pp. 1081, 1082; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 5 (1912), No. 13, p. 317*).—Living tubercle bacilli when contained in these sacks migrate through the capillaries of the vegetable vascular tissues (bacterial ultradiapedesis). By treating the reed sacks with collodion this migration can be stimulated or inhibited.

Tubercle bacilli killed with alcohol are well borne up to 1 gm. of substance by sound or tubercular animals. In some instances immunizing properties (protective and curative) were noted.

The treatment of tuberculosis with paratoxin, G. LEMOINE (*Rev. Mod. Méd. et Chirurg., 10 (1912), No. 1, pp. 6–11; abs. in Internat. Centbl. Gesam. Tuberkulose Forsch., 6 (1912), No. 7, pp. 365, 366*).—Paratoxin is an extract of the gall and contains lipoid-like substances which possess an antibacillary power. They probably exert their power in conjunction with the phagocytes. Several thousand patients treated with this preparation showed a decrease in bacterial toxemia, which was probably due to a diminution of the number of bacteria in the body.

Tuberculosis in cattle (*Brit. Med. Jour., 1912, No. 2692, pp. 263, 264*).—A statistical and general discussion by Delépine and Wilson in regard to the occurrence of tuberculosis in Germany, France, Great Britain, and Denmark at a conference of the veterinary association held at Melbourne.

The agglutination test in the diagnosis of bovine contagious abortion, J. MCFADYEAN and S. STOCKMAN (*Jour. Compar. Path. and Ther., 25 (1912),*

No. 1, pp. 22–38).—Continuing work previously noted (E. S. R., 22, p. 584), the authors now report results of further tests with nearly 700 animals. In their opinion the test has now passed the probationary stage and deserves to be adopted as a method for diagnosing suspected cases of contagious abortion.

Tuberculosis in the goat, M. G. Morel (*Hyg. Viande et Lait, 5 (1911), No. 11, pp. 642–646*).—This article points out the dangers which surround the utilization of raw milk obtained from tuberculous goats.

Experiments to determine the safe dose of white arsenic, Cooper's dip, and bluestone for sheep, A. Theiler (*Agr. Jour. Union So. Africa, 3 (1912), No. 3, pp. 321–351, figs. 2*).—The author has conducted a large series of experiments on sheep with a view to determining the maximal reliable dose of these drugs and mixtures thereof, which are frequently used in South Africa for the treatment of many diseases of all classes of domesticated stock, but more particularly in the treatment of sheep affected both with wireworms and tapeworms.

"It appears that arsenious oxid in the dose of 15, 30, and 45 grains is a safe dose for sheep, but it would not be wise to use the largest dose on a great number of sheep. . . . Cooper's dip administered to sheep in the doses of 15 grains had no fatal effect on 30 sheep. The 15 sheep belonging to the lot of 'watered 24 hours previous to and after dosing' were noticed to be 'off feed' the day following. With the dose of 30 grains, 48 sheep were dosed and 1 died the day following. . . . The dose of 22 grains bluestone appears to represent a safe dose for sheep; it may probably be slightly increased. The dose of 45 grains and more may cause death. . . . The dose of 30 grains white arsenic, mixed with 30 grains of bluestone, does not appear to be a safe dose for sheep. . . . The dose of 15 grains of Cooper's dip, added to 15 grains of bluestone, given in a mixture, seems to be a safe dose for a sheep. . . . A safe dose of a mixture of Cooper's dip and bluestone, when mixed with 2 substances which are considered to be harmless, such as salt and sulphur, became toxic, and caused death amongst the treated sheep."

The details of the post-mortem lesions in the 2 sheep which died from poisoning by arsenious oxid are presented in an appendix.

The importance of hog cholera and the production of hog-cholera serum, F. A. Bolser (*Amer. Vet. Rev., 40 (1912), Nos. 5, pp. 611–618; 6, pp. 765–771*).—This is a discussion of the history, geographical distribution, pathology, symptoms, and methods of treatment. It also discusses the preparation of the Dorset-Niles serum against hog cholera and describes its use.

Hog cholera (*Ann. Rpt. Bd. Live Stock Comrs. Ill., 25 (1910), pp. 66–70, pls. 4*).—This is a discussion of the nature of hog cholera, its distribution in Illinois, and the methods of preparing and using prophylactic hog-cholera serum.

Protective vaccination against hog cholera, J. Gyárfás (*Állatorvosi Lapok, 35 (1912), No. 25, p. 291–293; abs. in Berlin. Tierärztl. Wchnschr., 28 (1912), No. 31, p. 569*).—Vaccinations were made with the Hutyra hog-cholera serum and 1,592 hogs. Previous to the vaccination 14 hogs died and the epizootic was considerably advanced. After vaccination 353 animals died. In another locality out of 478 pigs vaccinated 2 died, and in a third barn where the vaccinations involved 507 head the loss was 9.4 per cent. The serum has no curative action according to the author.

Some investigations in regard to hog erysipelas, immune serum, and its action in the animal body, H. Holth (*Maanedskr. Dyrlæger, 24 (1912), No. 6, pp. 145–179; abs. in Berlin Tierärztl. Wchnschr., 28 (1912), No. 31, pp. 568, 569*).—Hog erysipelas immune serum does not possess any bactericidal properties, but contains relatively large amounts of specific agglutinins and ambo-

ceptors. Its activity depends upon the presence of antiaggressins which are antagonistic to the cellular toxins produced in the organism (body). Erysipelas serum stimulates phagocytosis only indirectly.

Tuberculosis of hogs, J. R. Mohler and H. J. Washburn (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 201, pp. 40, figs. 5*).—This is a revision of Circular 144 previously noted (E. S. R., 20, p. 982).

Autotherapy—its application in the treatment of septic diseases in the horse, D. J. Mangan (*Amer. Vet. Rev., 41 (1912), No. 4, pp. 422–433*).—Autotherapy, as proposed by Duncan, consists chiefly of the administration of crude autogenous pus. This method was tried with 12 horses, chiefly pyogenic infections, and possesses the advantage of not necessitating the preparation of a vaccine in a culture medium which is foreign to the organism. The results obtained were in most instances good.

Chronic catarrh in the uterus in a mare, V. S. Pschorr (*München. Tierärztl. Wchnschr., 55 (1911), No. 5, p. 70; abs. in Vet. Rec., 23 (1911), No. 1192, p. 720*).—A case diagnosed as uterine catarrh was found in a mare which would not breed and from the uterus of which a liter of whitish yellow stringy discharge was obtained. Aspiration with a catheter removed a bulk of 4 liters of fluid.

For treating the condition 5 liters of a solution of creolin was injected (dilution not given) and drained out. Then ¼ liter of a 2 per cent protargol solution was given in the same manner, but left in the uterus. After the fourth day no discharge was present, and none has been seen since.

What is the deadly new horse disease? (*Twentieth Cent. Farmer, 1912, No. 615, pp. 6, 7, figs. 5*).—A discussion of the outbreak of so-called cerebrospinal meningitis, which during the third week in August became epidemic in central and western Kansas and during the last week in the month crossed into Nebraska.

It's a pasture disease that is killing the horses (*Farmers Mail and Breeze, 42 (1912), No. 27, pp. 3, 16, 17, figs. 2*).—This paper discusses the occurrence of the disease of horses in Kansas and Nebraska noted above.

Intracellular bodies associated with equine anemia, W. B. Mack (*Proc. Amer. Vet. Med. Assoc., 48 (1911), pp. 378–382, pl. 1*).—In a bulletin on equine anemia, previously noted (E. S. R., 21, p. 584), the author referred to certain spherical bodies observed in the red blood corpuscles of individuals suffering from the disease. A further study has shown them to be present in every case of equine anemia studied and that they stain well by certain methods.

"In blood films properly fixed and stained they appear within the red corpuscles as small 'coccus-like' bodies or points, stained an intense, deep blue. They vary in size from about 1 μ in diameter to the smallest visible points. The form most frequently encountered is from about ½ to 1 μ in size, spherical in form, with outlines definite and clean cut. Slightly elongated forms occasionally occur. As a rule a corpuscle contains but 1, rarely 2 are found in the same cell. In some instances where 2 are included in a corpuscle they lie close together, apparently in contact, others are separated by about one-half the diameter of one of them, others again are more widely separated. In a majority of such instances the bodies or granules are about equal in size, but sometimes one of them is slightly larger than the other. Some of these bodies lie near the center of the corpuscle, others toward or at the periphery. Occasionally one appears to protrude from the cell containing it. Bodies identical in size, form, and staining reaction are frequently found outside the corpuscles, i. e., free in the fluid portion of the blood.

"Of the smaller forms frequently 2 or 3, rarely as many as 5 or 6, are found within a corpuscle, usually some distance apart. In such instances they may

be equal in size or one may be distinctly larger than the others. Frequently the space between them is stained less intensely than the remainder of the corpuscle and this somewhat clearer space bounded by faint, thread-like lines with just a suspicion of blue stain in them.

"Occasionally ring-shaped bodies, faintly defined, with a slightly bluish tint, are observed with usually 1, rarely 2 or 3, deeply stained granules situated at the periphery of the ring. They are very minute and easily overlooked. Whether the smaller forms bear any relation to the larger, 'coccus-like' bodies first mentioned remains to be determined. These bodies may be seen in slides fixed in methyl alcohol and unstained. . . .

"The frequency with which these bodies occur varies widely in different cases. In some they are comparatively few in numbers, in others numerous. . . . A diligent search for them in blood films prepared from several supposedly normal horses, several affected with pneumonia, influenza, strangles, etc., and from several surgical cases has failed to reveal them."

The "coccus-like" form is said to quite closely resemble the description and photographs of the protozoan genus Anaplasma described by Theiler as the cause of gall sickness in South African cattle. It is suggested that these bodies may be found to represent a new species of Anaplasma.

In sections of the liver from a typical case of equine anemia, stained by the Gram-Weigert method, the author found inside the hepatic cells certain very minute, ring-shaped bodies with a small granule at one side, at the periphery of the ring. Search for them in sections of liver from several animals where the liver showed various types and degrees of degeneration resulted negatively. The author thinks these ring-shaped bodies to be too definite and too uniform for degeneration products, as supposed by Todd and Wolbach (E. S. R., 25, p. 89) in work with swamp fever.

Studies on the etiology of equine influenza, N. S. FERRY (*Vet. Jour., 68 (1912), No. 442, pp. 185–197*).—The data presented in this paper, which was read at the meeting of the Society of American Bacteriologists at Washington, D. C., in December, 1911, have been noted from another source (E. S. R., 27, p. 86).

The etiology of equine influenza (*Vet. Jour., 68 (1912), No. 443, pp. 246–248*).—This is a review of the paper noted above.

Glanders of the lungs in horses with some notes on the serological detection of the disease, SCHÜTZ (*Centbl. Bakt. [etc.], 1. Abt., Orig., 64 (1912), Festschrift F. Loeffler, pp. 87–99*).—The glanderous nodules in the lungs of horses are either hematogenic or bronchogenic in origin. The following varieties of pulmonary infections with the glanders bacillus are mentioned and discussed in detail: (1) A glanderous cellular or cellular fibrinous inflammation of the lungs; (2) chronic (glanderous) indurative pneumonia and broncho-pneumonia; and (3) purulent bronchitis and peribronchitis. Mixed infections are also described. The agglutination and complement fixation tests are good methods for detecting this disease in horses.

A contribution on the treatment of contagious pneumonia of the horse with salvarsan, JACOB (*Ztschr. Veterinärk., 23 (1911), No. 8–9, pp. 406–411; abs. in Berlin. Tierärztl. Wchnschr., 28 (1912), No. 32, p. 588*).—In all of 12 cases of the pectoral form of influenza (brustseuche) in which the author administered salvarsan intravenously the temperature sank to normal within from 15 to 24 hours and continued so.

Bovine variola in chickens, O. CASAGRANDI (*Rev. Internat. Vaccine, 1 (1910), No. 1, pp. 1–27, pls. 3; abs. in Bul. Inst. Pasteur, 9 (1911), No. 21, pp. 939, 940*).—By inoculating the vaccine upon the skin or epithelium of chickens, which has been scarified or rubbed with sandpaper, the specific lesions (Cy-

toryctes) were produced. Young chickens were more susceptible to the vaccines than older birds. The skin of the thorax was particularly susceptible, more so than that of the wattles. The cornea was less sensitive. By inoculating the skin of the thorax many times successively immunity could not be produced, but inoculating a part of the wattle immunized the barb entirely. The author believes that chickens can be used for controlling vaccine virus.

An investigation of an outbreak of septicemia in poultry, R. A. WHITING (*Amer. Vet. Rev., 41 (1912), No. 4, pp. 456–459*).—A mortality of about 90 per cent in a flock consisting of 70 chickens and 12 turkeys was caused by an organism of the hemorrhagic septicemia group.

In regard to the growth and virulence of the organisms causing tuberculosis in fowls, C. WALTHER (*Arch. Path. Anat. u. Physiol. [Virchow], 207 (1912), No. 1, pp. 140–148; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 5 (1912), No. 3, p. 19*).—There are strains of the avian tubercle bacilli which culturally resemble the human type of bacilli, and which on inoculation (crude material or fresh cultures) show a high virulence for guinea pigs. After cultivating these organisms for a longer time than usual on artificial media the strains become more like the regulation avian tubercle bacilli. No appreciable reduction in virulence, as noted by other workers, could be determined.

RURAL ENGINEERING.

Irrigation: Its principles and practice as a branch of engineering, H. BROWN (*London, 1912, 2. ed., rev., pp. XV+301, pls. 9, figs. 68*).—This work deals with the practice of irrigation as a branch of engineering, sets forth the fundamental principles that should govern such practice and furnishes illustrations of their application to existing canal systems. It contains chapters on irrigation and its effects; basin irrigation; perennial irrigation and water duty; sources of supply; dams and reservoirs; methods of construction; means of distribution; masonry works; methods of distribution, assessment of rates, and administration; river training; agricultural operations and reclamation works; and navigation.

Some methods of measuring irrigation water practiced by the United States Reclamation Service (*Engin. and Contract., 38 (1912), No. 8, pp. 215–217, figs. 13*).—This is an abstract of a paper read by W. G. Steward before the Idaho Engineering Society, in which he describes canal, weir, and automatic gages, and gives discharge tables and discharge curves for different weirs and orifices used in water measurement under varying circumstances.

Irrigation: California, R. P. TEELE (*Washington: Bur. Census [U. S.], 1910, pp. 14, figs. 2*).—This article contains irrigation statistics for California dealing with the farms, acreage, and crops irrigated, irrigation works, and the cost of construction, operation, and maintenance.

Twenty-second annual report of the hydraulic engineer, J. B. HENDERSON (*Ann. Rpt. Hydraul. Engin. Queensland, 22 (1911), pp. 22+68, pls. 36*).—This reports the results of irrigation, power, and underground water investigations and surveys, and gives rainfall and hydrographic data and maps.

Experiments on the use of water for irrigation in South Africa, J. MULLIE (*Bul. Agr. Congo Belge, 3 (1912), No. 2, pp. 481–497, figs. 2*).—A discussion of the methods of irrigation employed, the duty of water, the drainage of irrigated soils, and the amount and frequency of irrigation required to satisfy the crops and soil conditions in South Africa.

Construction difficulties in the draining of irrigated lands, R. A. HART (*Nat. Land and Irrig. Jour., 6 (1912), No. 2, pp. 23–27, figs. 6*).—It is stated

that the nature of the soil itself is one of the chief factors tending to make the construction of drains in irrigated lands extremely difficult, and that where open ditch drains are required great difficulty is experienced in constructing them so that they will hold their shape. Because of this, covered tile drains are much more desirable in irrigated lands than open drains. The methods of design and construction of tile and open drains, intended to overcome as nearly as possible the difficulties presented by the soil conditions, are outlined.

[Methods of the preliminary organization of a 450,000-acre drainage and levee project in southeastern Missouri], L. T. Berthe (*Engin. and Contract., 38 (1912), No. 5, pp. 131–133, fig. 1*).—This article outlines the conditions and methods of bringing about the organization of this project, including a description of the district and its organization. The preliminary cost estimate was $2,585,000.

The scoop wheel as the pioneer for the drainage of lowlands, J. D. Beck (*La. Planter, 49 (1912), No. 9, pp. 141, 142, fig. 1*).—A discussion of the design, construction, and operation of the scoop wheel as used in drainage reclamation, outlining in detail the design of a 27 ft. wheel which has a possible actual discharge of 7,153 cu. ft. per minute at low lift. Several installations in operation in different localities are described, giving efficiencies ranging from 33 to 89 per cent.

Drainage by explosives, A. MacPherson (*Jour. New Zeal. Dept. Agr., 5 (1912), No. 2, pp. 126–133, figs. 3*).—This reports the results of experiments on the dynamiting of pakihi soil for drainage in Westland, New Zealand.

The soil was from 11 to 21 in. deep, above 2 or 3 alternate layers of hard packed sand and bowlders on cement formation and iron pan from 9 to 22 in. in thickness, with a porous substratum of free sand, shingles, and bowlders several feet in depth. The charge holes were bored 4 ft. apart, into and through the hard bottom. The first 2 plats were charged with 2 sticks of dynamite per hole, the third and fourth plats with 3 and 4 sticks, and the fifth and sixth plats with 5 sticks per hole.

The iron pan was not fractured by the explosion in any of the plats, holes about 1 ft. in diameter being the extent of its operation, yet the drainage through these holes has so far been fairly successful.

Roads, paths, and bridges, L. W. Page (*New York, 1912, pp. XIV+263, pls. 24, figs. 12*).—This book gives in concise and elementary form the fundamental principles governing the construction of roads, paths, and bridges for farm and neighborhood purposes, and outlines in detail the selection of material and methods of construction and maintenance. It contains chapters on the history of road building; road legislation and administration; locations, surveys, plans, and specifications; earth, sand-clay, gravel, and broken stone roads; selection of materials for macadam roads; maintenance and repair; roadside treatment; modern road problems; paths; and culverts and bridges.

Handbook for highway engineers, W. G. Harger and E. A. Bonney (*New York and London, 1912, pp. XIV+493, figs. 85*).—This book contains in compact form information ordinarily required in the field and office practice of road design and construction. It contains data for the inexperienced engineer or commissioner on the relative importance of the different parts of the design and the possibilities of economy without impairing the efficiency of the roads, and also cost data useful to anyone engaged in road work.

A third report on the public roads in Georgia, S. W. McCallie (*Geol. Survey Ga. Bul. 28, 1912, pp. 12*).—A report of the mileage of and expenditures on public roads in Georgia, given by counties for the year 1911, and calling attention to the increase in road mileage and to the profitable use of convict

labor. The total mileage is given as 83,986 miles; and the total expenditure on roads and bridges during 1911 as $4,127,899.

Practice of the Massachusetts Highway Commission in the construction and maintenance of state highways (*Engin. and Contract., 38 (1912), No. 8, pp. 208, 209*).—This is an abstract of a paper read by A. W. Dean before the Boston Society of Civil Engineers in which he describes the methods of construction and maintenance of the state highways of Massachusetts, more especially of bituminous and bituminous macadam roads.

An investigation of the road making properties of Missouri stone and gravel, W. S. WILLIAMS and R. W. ROBERTS (*Univ. Mo. Engin. Expt. Sta. Bul., 2 (1911), No. 3, pp. 70, figs. 10*).—Descriptions of the abrasion, cementation, impact, hardness, toughness, and absorption tests as applied to Missouri stone and gravel are followed by the results of investigations in each county and tabulated data giving the results of tests on the materials.

Limestone is the most abundant road material in the State, but only about 38 per cent of it will stand all the tests. It has good cementing qualities, however, and can be used as a base for macadam. The best road materials found are the granites, rhyolite, and porphyry, which have good cementing qualities and may be used for wearing surfaces. The gravel in the State is chiefly chert and flint and is classed as poor road material.

The road building materials of Coshocton County, Ohio, F. H. ENO (*Ohio State Univ. Bul., 16 (1912), No. 37, pp. 29, pls. 10, fig. 1*).—This bulletin discusses the road materials of this county, presents simple effective methods for using them for road improvement at a reasonable first cost, and gives the results of standard tests on these materials of which the largest part is limestone, gravel, and sandstone. The conclusions are that although this county does not have an abundance of permanent road material, by carefully selecting the best available material and following approved methods of construction under the direction of a competent engineer, good roads may be secured at reasonable first cost and farm values may be increased.

Methods of testing road making materials in European countries (*Engin. and Contract., 38 (1912), No. 11, pp. 293–298, fig. 1*).—This is an abstract of a report by A. Mesnager to the International Association for Testing Materials, containing a list of the road building materials used and an outline of the methods employed in testing them in Germany, Austria, Belgium, Denmark, Budapest, Norway, and the Netherlands.

Road maintenance problems, J. G. POWELL (*Surveyor, 42 (1912), No. 1075, pp. 271, 272*).—An extract from the annual report of the county engineer of Wiltshire, England, stating that the chief difficulties encountered in road maintenance are the heavy traffic and consequent wear and tear on the roads during periods of alternate frost and thaw, the existence of soft, yielding subsoil for road beds, the high growth of hedges and trees, and the wear produced by the increased number of mechanically propelled vehicles. It is further stated that roads to bear motor vehicle traffic must have new unyielding subbases as well as resurfacing, and that flint for surfacing is cheaper and more satisfactory than limestone in this locality.

Reinforced concrete design, O. FABER and P. G. BOWIE (*London, 1912, pp. XIX+332, figs. 160*).—This book presents the fundamental principles underlying the practical design of reinforced concrete, which are to be used in connection with practical work and in experiments in determining the proper design to suit any local conditions. It deals with several important new considerations among which are the ratio of live to dead load as affecting the bending moment of beams, and the relative stiffness of beams and columns.

Dynamite on the farm (*Agr. Jour. Union So. Africa, 3 (1912), No. 6, pp. 802–806*).—This article notes the results obtained by subsoiling with gelignite, a high velocity explosive, and with specially prepared agricultural dynamite, a low velocity explosive. In using the gelignite the charges were sunk from 3½ to 5½ ft., the best results being obtained from the shallower charges. The dynamite gave much better results than gelignite, since, as a low velocity explosive, it pulverized the subsoil over a much larger area. The facts as noted indicate that for success and safety the work must be carefully and properly handled. "Rules of thumb" must be avoided and nothing but the correct implements and explosive to satisfy local conditions must be used.

Study of agricultural machinery, M. ESTRADA (*Bol. Min. Agr. [Buenos Aires], 14 (1912), No. 4, pp. 337–344*).—A discussion of experimental work on agricultural machinery in Argentina and the United States and of agricultural engineering education in the United States, dealing especially with motor machinery, rural architecture, sanitation, irrigation, and drainage.

How the plow hitch affects draft (*Threshermen's Rev., 21 (1912), No. 3, pp. 9, 44, 46, 48, figs. 3*).—A graphical and mathematical analysis of draft and a few suggestions pertaining to the hitching of engine gang plows are given.

The conclusions are drawn that the best results are obtained by making the hitch a little to the right of the center of the plow and by hitching as high on the engine as possible without carrying the front end of the plow off the ground, and that the larger the plow the more economical it is in power. From the graphical analysis the formula is deduced for the desired hitch for any sized plow of $D=\frac{AC}{2C+B}$, in which D = the distance in inches from the first plow center to the hitch, A = distance from the center of the first plow to the center of the last plow, measured at right angles to the furrow, B = the distance from the center of the first plow to the center of the last plow, measured parallel to the furrow, and C = the distance in inches from the front plow bottom to the engine draw bar. For practical conditions 12 in. should be added to D.

Fifth Winnipeg motor contest, P. S. ROSE (*Amer. Thresherman, 15 (1912), No. 5, pp. 3–11, figs. 18*).—This contest was primarily one of fuel economy, being divided into 3 main divisions: (1) a 2-hour economy brake test during which the engines were supposed to run under their most economical load and have determinations made of the fuel required per horsepower hour; (2) a ½-hour maximum brake trial under maximum load, with a fuel and water consumption determination; and (3) a plowing test in which each tractor was given a certain amount of land to plow and accurate records were kept of fuel consumption.

The tractive efficiencies as determined were very high, due to the good ground condition, the gas tractors giving efficiencies from 59 to 88 per cent. The steam engines showed considerably lower efficiencies. The results and accompanying data indicate a 25 per cent increase in average economy since 1910, due principally to advancement in the art of engine building, which is sufficient also to counteract the advance in price of gasoline.

The status of the motor plow question in Germany, MARTINY (*Kühn Arch., 2 (1912), pt. 1, pp. 193–229, figs. 12*).—A general discussion of the theory of operation of the motor plow, presenting graphical and mathematical explanations of the losses by sinking and slipping of drive wheels in different types, the action of plowshares in different hitches, etc., followed by the results of practical experiments and by discussions of the efficiency, practicability, and flexibility of various types.

Tests of motor plows, B. MARTINY (*Mitt. Prüf. Stat. Landw. Masch. u. Geräte, Halle, 1912, No. 163, pp. 46, fig. 1*).—The methods and results of tests are given of 3 types of motor ground breaker, namely, the ordinary motor plow, the motor plane plow, and the combination motor and rotary ground breaker. A general discussion is given of the methods of motor operation and draft employed by different makes, the power required, and the results obtained under varying conditions of soil and weather.

Agricultural motor trials in Algeria (*Impl. and Mach. Rev., 38 (1912), No. 449, pp. 651–653, figs. 5*).—This article compares the results of several sets of plowing trials on motor tractors taken at different times of the year under varying conditions of soil and atmosphere. The results show the fallacy of judging the machines and overestimating the results as obtained from the tests of only 2 or 3 days' duration, as has been the custom, and indicate that a comparison is only possible when the machines are employed for various conditions of work over the greater part of the year.

Gasoline as a fuel for motor use (*Farm Machinery, 1912, Nos. 1087, pp. 32, 34; 1088, pp. 30, 32; 1089, p. 16*).—This is a scientific study of the different grades of gasoline, indicating that gravity is no criterion as to the quality, as is commonly accepted, but that the quality of a gasoline is expressed by its initial, intermediate, and maximum boiling points.

The ordinary gasoline has several boiling points, portions of it vaporizing at low temperatures and others at from low to high temperatures. For easy starting, a gasoline engine requires a gasoline with low initial boiling points, but as it warms up it requires higher and higher boiling points in the gasoline to satisfy the increasing demand for power, consequently gasoline to produce the best results in a motor must have low initial boiling points, gradually rising to high boiling points. A high-gravity gasoline is no better than a low-gravity gasoline if they have the same boiling points.

Steam or electricity in dairy work (*Molk. Ztg. [Hildesheim], 26 (1912), No. 58, pp. 1087, 1088; Landw. Masch. u. Geräte, 12 (1912), No. 17, pp. [1–7]*).—A comparison of the uses of steam and electricity in an average small dairy, giving the daily and yearly cost figures for the operation of a 10-horsepower steam engine and an 8-horsepower electric motor. It indicates that electric power must cost as low 2½ cts. per kilowatt hour in order to give the economy of steam when both machinery driving and milk and water heating are taken into consideration.

Library of Agriculture—Country life conveniences and enjoyments, edited by H. M. SKINNER and A. L. MCCREDIE (*Chicago, 1912, vol. 8, pp. 502, figs. 61*).—This book is made up chiefly of reprints of Farmers' Bulletins of the U. S. Department of Agriculture.

RURAL ECONOMICS.

[Questions relating to rural economics], H. L. RUSSELL ET AL. (*Bul. Univ. Wis., 1912, No. 509, pp. 125, figs. 24*).—This bulletin presents the papers given at the Second Wisconsin Country Life Conference conducted under the auspices of the College of Agriculture of the University of Wisconsin. Among those relating directly to the economic side of country life the following are noted: Value of Cooperation Among Farmers, by G. F. Comings; Efficient Use of Labor on the Farm, by H. C. Taylor; Hired Labor on the Farm and in the Home, by W. L. Nelson, and The Decline in Rural Population, by B. H. Hibbard.

Financing the farm, M. T. HERRICK (*Addresses Ann. Meeting Ohio Bd. Agr., 1912, pp. 28–43*).—An address delivered at the annual meeting of the Ohio State Board of Agriculture, Columbus, Ohio, January 10, 11, 1912, in which the author illustrates the economic significance of scientific methods in farming by statistics

of the production per acre of the leading crops in countries where such methods have been applied and where not applied. He also draws attention to the part played in Germany and France by agricultural cooperative societies in promoting scientific farming by teaching farmers to appreciate the possibilities of scientific methods, and by supplying them with funds to make the needed changes and improvements. He discusses at length the systems of agricultural credit in France and Germany and their possible application to conditions in the United States.

Agricultural cooperation in Ireland, C. Poe (*Prog. Farmer, 27 (1912), Nos. 30, pp 11, 18; 31, pp. 11, 19*).—This is a popular article describing in more or less detail the work of cooperative credit banks, cooperative creameries, poultry societies, etc., in Ireland, with suggestions as to the possible application of the principles involved in the South.

Live stock improvement syndicates in France and recent state encouragement (*Internat. Inst. Agr. [Rome], Bul. Bur. Econ. and Soc. Intel., 3 (1912), No. 5, pp. 15–31*).—This article gives special attention to the active movement of syndicates in live-stock improvement in France, and the recent encouragement from the government and various public bodies.

The chief objects of the syndicates are the purchase and maintenance of good bulls, the keeping of herd books and records of performance, and assisting in the sale of stock. To encourage the movement the French government voted 200,000 francs to be used in promoting the work of the live-stock improvement syndicates in 1912. The syndicates are also permitted to receive subsidies under certain conditions. The appendix contains the rules adopted by some of the syndicates.

How the sale of live stock is organized in Austria (*Internat. Inst. Agr. [Rome], Bul. Bur. Econ. and Soc. Intel., 3 (1912), No. 7, pp. 3–12*).—This article describes the work of the general federation of the agricultural cooperative societies of Austria in the marketing of live stock for individual breeders.

Reliable agents residing in the principal centers of production are employed to collect the live stock which individuals have for sale and forward it to the "Viehverwertungsstelle" of some city. Here the agents of the federation sell the animals to the best advantage, and after deducting expenses, but without any commission charges, forward to the breeders the returns. This method of marketing enables the isolated breeder to take advantage of the better terms offered by the large markets and thus secure for himself profits which would otherwise go to the middleman. The value of live stock sold in this way increased from about $37,000 in 1907 to about $2,635,000 in 1911.

A detailed account of the actual workings of a number of these associations, together with the encouragement given by the State, is also given.

The German potash industry and potash legislation, J. Schönemann (*Die Deutsche Kali-Industrie und das Kaligesetz. Hanover, 1911, pp. VII+152, pls. 10*).—This publication presents a detailed discussion of the importance of the German potash industry; the motive of legal regulation of the industry; history of the legislation, and its economic significance as applied to the mine owner, manufacturer, dealer or consumer, and laborer; its influences upon foreign countries; and the treatment of contracts with American trusts.

Agricultural reciprocity between America and China, G. W. Groff (*Canton Christian Col., Dept. Agr. Invest. Bul. 5 [1912], pp. 40, figs. 34*).—This bulletin deals with a comparison of American and Chinese agricultural methods, states the opportunity for mutual helpfulness, suggests the field for service, and outlines an organization through which the work may be accomplished.

The original home of agriculture of the Indo-Germanic people, R. Braungart (*Die Urheimat der Landwirtschaft aller Indogermanischen Völker. Heidel-*

berg, 1912. pp. VIII+470, pl. 1, figs. 266).—A history of the agriculture of the ancient inhabitants of Europe and Asia, presented in the form to support the view that the agriculture of the Indo-Germanic tribes had its origin in central or northern Europe. The work is the result of many years' study of the cultivated plants and primitive farming implements.

Annual and average production of and international trade in important agricultural products, by countries, R. T. McKenna (*U. S. Dept. Agr., Bur. Statis. Circ. 31, pp. 30*).—This circular presents a compilation from the Yearbooks of this Department of data showing the annual and average production of important agricultural products in the leading agricultural countries, with the percentage each contributes to the total annual production, together with similar data respecting exports and imports of certain agricultural products.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 14 (1912), No. 7, pp. 49–56*).—Notes and statistics are here presented showing the acreage and condition of the leading crops in the United States July 1, by States, with comparisons; acreage and estimated production of wheat, rye, barley, and oats in various countries as shown by the report of the International Institute of Agriculture; distribution of the land area in continental United States, 1910; farm value of important products; condition of cereals in various foreign countries June 1; temperature and precipitation statistics; acreage and condition of tobacco by types July 1; monthly receipts and stocks of eggs and poultry in the United States; and the range of prices of agricultural products at important markets; the text of a recent act relating to the issuing of cotton reports; and other data.

Improving Canadian agriculture, J. W. Robertson (*Com. Conserv. Canada Rpt., 3 (1912), pp. 89–105*).—Observations are here made regarding systems of agriculture in Canada and methods of improving them, as the result of a survey of 1,212 Canadian farms by the Commission of Conservation, appointed to inquire into and report on questions relating to conservation of soil fertility, agricultural labor, health, and prosperity of the country.

It is noted that a varying number of farms in each of the 9 Provinces investigated reported increases in the yield of crops as compared with 10 years ago except in Manitoba where no farms reported an increase, but 46 out of 100 reported a decided decrease. The general conclusion reached by the commission is that where a systematic rotation of crops prevailed there has been from two to three times the profit to the farmers and a conservation of fertility.

Agricultural survey [in Canada], 1911, F. C. Nunnick (*Com. Conserv. Canada Rpt., 3 (1912), pp. 106–129, table 1, pls. 4*).—A brief summary of the agricultural conditions found in each Province by the Commission of Conservation is here presented, together with tables giving detailed figures relating to conditions found, and a reproduction of the question schedule used in the collection of the information. The following table presents figures relating to the number of farms, acreage, etc., investigated in each Province:

Number of farms, acreage, etc., investigated in 9 Canadian Provinces.

	Nova Scotia.	Prince Edward Island.	New Brunswick.	Quebec.	Ontario.	Manitoba.	Saskatchewan.	Alberta.	British Columbia.
No. of farms studied	100	100	100	200	800	100	87	85	149
Total acreage	16,893	10,992	13,991	30,552	83,840	39,999	35,346	22,732	67,428
Field crop acreage	5,958	8,220	6,836	19,460	24,634	28,045	24,616	16,220	14,561
Cereal acreage	1,072	2,508	1,750	5,640	10,917	26,083	24,149	12,855	3,602
Hoe crop acreage	277	516	249	806	3,126	295	----------	89	1,993
Hay and pasture	4,609	5,196	4,837	13,014	10,596	1,757	----------	----------	9,846

Agricultural statistics, 1911, R. H. REW (*Bd. Agr. and Fisheries [London], Agr. Statis., 46 (1911), No. 4, pp 275–375, fig. 1*).—This report contains detailed statistics of the imports and exports of agricultural produce into and from the United Kingdom and the returns of the trade in live stock between Great Britain and Ireland in 1911, with comparisons. The total value of the chief kinds of imported food, excluding sugar, rice, and lard, was £149,635,000, as compared with £27,835,000, as the average value for the 7 years 1856–1862. The greatest increase in quantity was meat, the over-sea supply increasing from 5.3 lbs. per head in 1856–1862 to 15.5 lbs. per head in 1905–1911.

General statistics in France (*Ann. Statis. [France], 30 (1910), pp. 102–104, 109, 110, 43*–45*, 182*–189**).—An official report giving detailed statistics regarding number and memberships of professional, industrial, commercial, and agricultural syndicates in France, June 1, 1910. The agricultural syndicates, according to the report, numbered 4,948, with a membership of 813,038, of which 14,720 were women. There were 77 unions of agricultural syndicates and 4,726 affiliated syndicates, with a membership of 1,067,417.

Other statistics are given as to number and work of mutual agricultural credit banks, together with data pertaining to various crops from 1815 to 1911 in France, including tables which show the area and production of wheat, oats, potatoes, etc., in various other countries from 1850 to 1911.

[Agricultural statistics of South Australia], L. H. SHOLL (*So. Aust. Statis. Dept. Bul. 1, 1912, pp. 16*).—This bulletin presents final results of the cereal, hay, and fodder crops in South Australia for the year 1911.

The total area under cereal cultivation was 2,907,182 acres, of which 2,607,206 acres was in wheat, which gave an average yield of 9.29 bu. per acre, a decrease of 2.28 bu. as compared with the previous year. The total value of the grain, hay, and fodder crops is estimated at £5,410,005.

[Live stock statistics of South Australia], L. H. SHOLL (*So. Aust. Statis. Dept. Bul. 2, 1912, pp. 4*).—In this report is shown the final results of live stock statistics in the various counties and divisions of South Australia for the year 1911. The cattle numbered 393,566, an increase of 8,704 over last year; horses 259,719, an increase of 10,393; sheep 6,171,907, a decrease of 95,570; and dairy cows 121,803, an increase of 2,175. The amount of butter made is reported at 9,694,666 lbs., a decrease of 1,022,820 lbs., and cheese 1,517,561 lbs., a decrease of 278,720 lbs. The butter exported amounted to 2,079,195 lbs., valued at £103,875.

AGRICULTURAL EDUCATION.

The educational value of agriculture, E. BARNES (*Advance print from Nat. Ed. Assoc., Proc. Dept. Superintendence, 1912, pp. 147–150*).—Some of the advantages of instruction in elementary agriculture when well given, according to the author, are as follows: (1) It commands from the start a wide range of the interests most common to children, (2) it forces measures and comparisons, and judgment thereon, upon the child at every turn, (3) it trains a child to be careful, exact, patient, and persistent, (4) it offers in the gardening work all the elementary problems of form, color, and proportion, and so lays the foundations of a sense of beauty, (5) it affords abundant opportunity for emulation and cooperation, and (6) it teaches boys and girls to work. Inasmuch as it discourages pure reasoning, students should also be taught pure mathematics, logic, and languages. The author points out that "our trouble in the past has been that we have tried to take our school children directly into this abstract world of exact thinking and exalted feeling without passing them

through the preliminary stages of concrete experience, elemental virtues, and active self-expressions."

Report to the forty-seventh general assembly of the State of Illinois (*Springfield: Ill. Ed. Com., 1911, pp. 126*).—This is a report of the work to date of the Illinois Educational Commission, appointed by the governor in 1907 to examine into the need of changes in the school laws.

Among the recommendations of the commission is a comprehensive plan for providing vocational courses in the public schools of the State. It was also recommended that the high-school curriculum distinctly recognize the vocational needs of the pupil, to the extent of at least one-fourth of the student's time; that the nature-study work of the grades be of such a character as to prepare the child for an intelligent choice of his vocational course; and that schools be advised to ascertain to what extent pupils are engaged in duties outside of school, and in case such duties are definite and regular that proper credit should be given.

Third annual report of the Congressional district agricultural schools of Georgia, J. S. STEWART (*Bul. Univ. Ga., 1912, No. 188, pp. 39, figs. 2*).—The attendance for 1911 in the 11 schools was 1,338, representing 110 counties. The farm products for the year amounted to $33,818. The schools own livestock valued at $20,828, and farm tools valued at $8,000.

The majority of the schools now charge less than $10 a month for board, and require from 20 to 36 hours' work without pay. Additional work is paid for at 10 cents an hour.

Agricultural education in Canada, J. K. DOHERTY (*Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 1, pp. 40–45*).—Brief accounts are given of the object and work of the Ontario Agricultural College, the Manitoba Agricultural College, Macdonald College, Saskatchewan University, Nova Scotia Agricultural College, and the Agricultural Institute of Oka, Quebec, and of the college extension work in Ontario.

Status of agricultural instruction (*Rap. Trien. Chambres Lég. Min. Agr. et Trav. Pub. [Belgium], 1906–1903, pp. XVIII+315*).—This is a report for the years 1906, 1907, and 1908, submitted by the Minister of Agriculture and Public Works to the legislative chambers of Belgium, on the collegiate, secondary, elementary, and itinerant instruction in agriculture, horticulture, and home economics; educational value of agricultural expositions; agricultural libraries; and inspection of agricultural instruction in Belgium. In the appendixes detailed information is given concerning the general organization, curriculum, government aid, experiments, faculty, publications, attendance, etc., of each institution under the direction of the department.

Agricultural instruction in Denmark, A. M. T. WESTERMANN (*Bul. Mens. Off. Renseig. Agr. [Paris], 11 (1912), No. 4, pp. 483–489*).—An account is given of the status of agricultural instruction in Denmark in 1909–10, including agricultural apprenticeships, agricultural instruction in the 58 secondary schools, itinerant agricultural instruction, agricultural instruction for soldiers, and higher agricultural instruction at the Royal Agricultural and Veterinary Institute at Copenhagen.

Report of the Alnarp Agricultural and Dairy Institute, 1911 (*Ber. Verks. Alnarps Landtbr. och Mejeri Inst., 1911, pp. 32, pl. 1*).—This is a report on the work of the institute during the year.

Horticultural instruction in the Netherlands, K. SCHECHNER (*Land u. Forstw. Unterrichts. Ztg., 25 (1911), No. 3–4, pp. 316–319*).—The author gives an account of the system of horticultural instruction in the Netherlands, including higher instruction at the Royal Agricultural, Horticultural, and Forestry High School at Wageningen; secondary instruction at the horticul-

tural winter schools at Aalsmeer, Boskoop, Naaldwijk, and Tiel, and the Girard Adriaan van Swieten Forestry School at Fredericksoord; elementary instruction in special winter courses; special courses for adults; and courses for public-school teachers.

A new feature of agricultural instruction in Prussia (*Land u. Forstw. Unterrichts. Ztg., 25 (1911), No. 3–4, pp. 313–315*).—An account is given of the object, organization, admission requirements, curriculum, etc., of the seminars for farmers being established by the chambers of agriculture in Prussia under the control of the Ministry of Agriculture, Domains, and Forests.

Statistics of education in the Kingdom of Wurttemberg for 1910 (*Statis. Unterr. u. Erziehungsw. Kgr. Württemb., 1910, pp. 70*).—This publication includes statistics of the agricultural institutions in the Kingdom of Wurttemberg, viz, the agricultural high school and stations at Hohenheim, veterinary high school at Stuttgart, the farm schools at Ellwangen, Kirchberg, and Ochsenhausen, the viticultural school at Weinsberg, 8 agricultural winter schools, agricultural continuation schools, short courses, etc.

[Agricultural and forestry education in Austria and other countries] (*Land u. Forstw. Unterrichts. Ztg., 25 (1911), No. 3–4, pp. V+221–381*).—In addition to several articles abstracted elsewhere in this issue, this report includes the following: The Problems of Moral and Religious Training in Elementary Forestry Instruction, by K. Pusch; Equipment and Profitableness of the Farms of Agricultural Education Institutions in Austria; Review of Agricultural Literature and of Annual Reports of Agricultural and Forestry Education Institutions for 1910–11; and miscellaneous notes.

The objects of the experiment farm of the Royal Imperial Agricultural High School, Adolf Ritter von Liebenberg (*Land u. Forstw. Unterrichts. Ztg., 25 (1911), No. 3–4, pp. 229–240*).—The author discusses the objects and work of the experiment farm of the Vienna agricultural high school, which is located at Grossenzersdorf, from the standpoint of a complete experimental farm as distinguished from the demonstration fields of the majority of schools.

A thirty-year cycle in agricultural school existence, F. Kozeschnik (*Land u. Forstw. Unterrichts. Ztg., 25 (1911), No. 3–4, pp. 254–269*).—The author gives an account of the beginnings of the farm and viticultural school at Feldsberg, in Lower Austria, as showing the difficulties and requirements of teachers at that time.

The rural continuation school for boys and girls, Kerschensteiner (*Arb. Deut. Landw. Gesell., 1910, No. 167, pp. 130–195*).—Of the 3 views current for the development of the rural continuation school, viz, (1) that it should continue subjects of instruction given in the public elementary schools, (2) that it should give theoretical instruction in agriculture, and (3) that it should give practical instruction in agricultural subjects particularly adapted to its locality, the author favors the latter and presents reasons therefor. An appendix gives 32 suggestions concerning the organization of rural continuation schools and the assistance of itinerant instructors in their development.

Announcement of farmers' short courses for 1912 at the University Farm, Davis, Cal. (*California Sta. Circ. 78, pp. 23, figs. 12*).

NOTES.

Alabama Canebrake Station.—W. G. Little, of Livingston, has succeeded E. B. Martin as a member of the board of control.

Arizona Station.—Dr. O. C. Bartlett has been appointed assistant state entomologist. A. L. Enger has succeeded F. C. Kelton as assistant engineer.

Arkansas University and Station.—H. E. Truax has been appointed assistant plant pathologist, and has entered upon his duties.

California University and Station.—The new agricultural building was dedicated November 20, with addresses by President Wheeler, ex-Dean Wickson, Dean Hunt, Prof. F. R. Marshall, and others. During the exercises Dr. Hunt was formally installed as dean and director, and a bust of Dr. E. W. Hilga was presented by the president of the agricultural club, a student organizati

Dr. Le Roy Anderson has been appointed professor of dairy industry, Harry S. Baird instructor in dairying at Davis.

Connecticut State Station.—W. O. Filley has been appointed state and station forester, vice S. N. Spring, whose resignation has been previously noted; and A. E. Moss has been appointed assistant station forester. R. B. Roe, assistant chemist, resigned October 1 to engage in commercial work.

Connecticut Storrs Station.—Director L. A. Clinton has resigned to accept a position with this Department in charge of the farm management investigations in New York, New Jersey, Pennsylvania, and New England.

Florida University and Station.—A monthly grant has been made by the Florida Citrus Exchange for investigating the changes in the sugar and acid content of citrus fruits. A citrus seminar was held at the station October 8 to 10, with an attendance of about 60, for the discussion of the subjects under investigation.

C. L. Willoughby, formerly of the Georgia Station, has been appointed head of the department of animal husbandry and dairying in the university, and James H. Carpenter has been appointed assistant chemist.

Idaho University and Station.—The division of agronomy has been subdivided into a department of field crops and farm management and a department of soils and soil physics, under the direction respectively of Frank L. Kennard as associate professor of field crops and farm management, and Dr. P. P. Peterson, of the Wisconsin Station, who has been appointed professor of soils and soil physics.

Other appointments include Orlo A. Pratt as assistant in plant pathology in the university and assistant plant pathologist in the station; John C. Kinzer, a graduate of the university, as assistant animal husbandman in the station; Earl C. Hall, a 1912 graduate of the university, as agricultural field agent for Bonner County in cooperation with this Department and with headquarters at Sandpoint; and George B. Caine as agricultural and dairy field agent for Lincoln County, in cooperation with this Department.

Illinois University and Station.—A new $50,000 glass house for the college and station is now under construction. One portion of it will be used for

floriculture and another for plant breeding and vegetable gardening. The former horticultural greenhouse has been rebuilt for work in agronomy. The central portion of the stock judging pavilion is to be completed in the near future.

A. L. Whiting, who received the degree of Ph. D. from the university in June, has been appointed instructor in soil biology; O. M. Allyn assistant in crop production, vice Arthur Lumbrick, resigned to become manager of an estate; and S. J. Bole instructor in pomology and assistant in plant breeding.

Purdue University.—H. B. Switzer, a 1912 graduate of the college of agriculture, has been appointed assistant in dairy bacteriology.

Iowa College.—The veterinary buildings under construction have been completed at a cost of $200,000. The group consists of 5 buildings, inclosing an inner court 163 by 106 feet, and contains an administration building, one for pathology and bacteriology, one for physiology and pharmacy, a clinic and hospital building, and an anatomy building. Eventually a sixth building for research and experimental work is to be included.

It is expected that 103 extension short courses will be held in the State during the coming season. New courses have been added in poultry husbandry, bookkeeping, veterinary science, entomology, and concrete construction.

E. F. Ferrin has accepted the assistant professorship of animal husbandry.

Kansas College and Station.—T. J. Headlee has been appointed state entomologist of New Jersey and has been succeeded by G. A. Dean in entomology and Dr. R. K. Nabours in zoology. Other appointments include Edwin C. Johnson, of Minnesota University, as superintendent of farmers' institutes; C. D. Steiner in charge of boys' clubs; G. O. Greene, specialist in horticulture in the extension department; Dr. C. W. McCampbell as assistant professor of animal husbandry and assistant in animal husbandry; E. A. Langworthy in charge of the feeding stuffs inspection; C. M. Vestal assistant in animal husbandry; Dr. Maurice C. Tanquarry assistant in entomology; and R. A. Jehle instructor in botany.

Recent resignations include P. N. Flint as assistant professor of animal husbandry, Dr. N. E. Stevens as instructor in botany and assistant plant pathologist, and C. V. Holsinger as horticulturist of the extension department.

Kentucky University and Station.—Recent appointments include the following: In the university, James A. Farra as assistant professor of farm mechanics, R. E. Knapp as assistant professor of bacteriology, Ralph Kenney as instructor in soils, and H. B. Hendricks and J. H. Carmody in extension work, the former in agronomy and the latter in horticulture; and in the station James E. Mastin, James S. McHargue, and G. D. Buckner as assistant chemists, Walter Schepplemann and E. F. Worthington as food inspectors, R. L. Pontius and L. W. McElyea as assistant veterinarians, and W. D. Nicholls and G. C. Routt as assistant animal husbandmen.

Louisiana University.—Elizabeth B. Kelley has been appointed professor of home economics in the extension division.

Maine Station.—Dr. O. A. Johannsen has resigned to become assistant professor of biology in Cornell University.

Maryland College.—The main administration building and the dormitory were destroyed by fire November 29, causing an estimated loss of $270,000, partially covered by insurance. President R. W. Silvester has resigned on account of ill health and has been appointed president emeritus and librarian. Prof. T. H. Spence has been designated acting president.

Massachusetts College and Station.—The apple packing team won first place in the intercollegiate contest held in Boston, November 8, with New Hampshire second and Vermont third. In the apple judging contest New Hampshire was

first, Massachusetts second, and Vermont third. George R. Pierce has resigned as assistant chemist in the station to accept a commercial position in Cuba, and B. G. Southwick has resigned as secretary to the director to become manager of a farm in Pennsylvania.

Michigan College.—C. E. Newlander has been appointed instructor in dairy manufactures and has entered upon his duties. Joseph C. Bock, instructor in chemistry, has been appointed chemist in the nutrition laboratory of the Carnegie Institution of Washington.

Minnesota University and Station.—During the past summer the university carried out a program of lectures and demonstrations, interspersed with entertainments, over the State, which was divided into three circuits of six accessible centers each. Each circuit received a week's attention, and through the use of six groups of lecturers each center in the circuit had the advantage of the entire week's program. The program included a farmers' day, a town and country day, business men's day, a home welfare day, a public health day, and an art and literature day. The expenses were met by an advance guaranty from each community of $300.

One feature of the program was the farmer boys' camps, held at most of the centers. The camp leader drilled his boys in farm mechanics, took them to farms and gave them lessons in stock judging, and led them in other ways. The object of this university week was to bring the people of town and country together to receive instruction of a kind "to increase the attractiveness, dignity, and profit of life on the farm and in the town."

Recent appointments include Arthur C. Smith as poultryman; E. W. Major, of the University of California, as associate professor of animal nutrition and assistant dairy husbandman; C. W. Howard, of the Rockefeller Institute, as instructor in entomology and assistant entomologist; Masaji Kugimoto as assistant in animal nutrition; and Mark J. Thompson in charge of the farm at Duluth.

Plans have been approved for a dairy laboratory at the North Central Farm at Grand Rapids. The Cloquet substation is to be maintained on a cooperative basis with this Department.

Missouri University and Station.—A course in rural economics is being offered for the first time in connection with the regular course in agriculture. The work is being given by S. D. Gromer, recently appointed secretary of the university extension service. The first term of the two-year winter course in agriculture opened with an enrollment of 183 students.

The station has begun to issue a series of numbered press bulletins in addition to the press notices previously sent out.

John A. Ferguson, professor of forestry, has accepted a similar position at the Pennsylvania College, this taking effect January 1, 1913. Recent appointments include Ernest C. Pegg as instructor in forestry, and the following assistants in the station: L. B. Burke in animal husbandry, Ray Evans and M. A. R. Kelly in agronomy, William Regan in dairy husbandry, and T. T. Tucker in veterinary science. C. B. Hutchison, assistant professor of agronomy, has been granted a year's leave of absence to take up graduate work at Cornell University.

Nebraska University and Station.—Recent appointments include H. E. Bradford as principal of the school of agriculture, J. R. Cooper, of the Kansas College, as assistant professor of horticulture and assistant horticulturist, Miss Alice M. Loomis, of the Wisconsin University, as professor of home economics, and Miss Anna Olsen as adjunct professor of home economics.

New Hampshire College.—W. R. Wilson, a 1912 graduate of Cornell University, has been appointed instructor in dairying.

New Mexico College and Station.—An entirely new board of regents has been appointed, consisting of J. H. Paxton president, M. O. Llewellyn secretary and treasurer, A. H. Hudspeth, R. R. Larkin, and F. E. Lester, with Governor W. C. MacDonald and Hon. A. N. White, state superintendent of public instruction, as ex-officio members. R. E. Willard has resigned as assistant professor of agronomy to accept a position with the Farm Management Investigations of this Department.

The horticultural and agronomy departments have instituted cooperative experiments in the breeding of onion seed.

Cornell University and Station.—The new department of forestry is offering a full professional course of 5 years, leading to the degree of B. S. at the end of the fourth year and that of M. S. a year later. Work for the Ph. D. degree is also offered, as well as a one-year course in the elements of forestry.

The horticultural library of the late Professor Craig has been donated to the horticultural department of the college of agriculture. The collection includes over 3,000 volumes, being especially rich in the subject of pomology.

Dr. H. J. Webber has accepted a position with the University of California as professor of plant breeding, director of the citrus substation at Riverside, and dean of the proposed school of tropical agriculture. Robert Matheson has been appointed entomologist for the Province of Nova Scotia and professor of zoology at the Nova Scotia Agricultural College.

North Carolina College Station.—Joseph F. Brewster (Ph. D. Berlin, 1912) has been appointed assistant chemist.

Ohio State University.—The new poultry plant was formally opened October 12. The equipment comprises an instruction building and incubator house, a laying house 126 feet long, and a brooder house. At present over 1,000 fowls are being kept. A total of 18 students are registered in the course.

J. H. Gourley, of the extension department, has accepted the position of head of the horticultural department at the New Hampshire College and Station. Recent appointments include Donald J. Kays, a 1912 graduate of the University of Illinois; William Hislop (M. S. Kansas College, 1912), and Gilbert Gusler (Ohio, 1912) as instructors in animal husbandry; R. B. Stolz (Ohio, 1912) as instructor in dairy husbandry; M. C. Sewell as instructor in soils; and Ralph R. Jeffries as assistant in horticulture.

Oklahoma College and Station.—The new college year opened September 2 with an enrollment of over 700 students in regular courses, and this will probably reach 1,200. Many changes in the buildings and the completion of the new engineering building serve to facilitate the work of both the college and station. The department of agronomy is now conveniently housed in its own building, with ample room for soil work, grain judging, and farm machinery studies. The chemical department of the station has moved to the chemistry building, thus bringing all the work in chemistry under one roof. The vaccine and Bermuda grass work of the station have been transferred to the departments of veterinary science and animal husbandry respectively of the college.

Ray Painter has been appointed assistant in entomology.

Oregon College and Station.—M. M. McCool (Ph. D. Cornell, 1912) has been appointed assistant professor of soils and assistant agronomist, E. M. D. Brocker, of Purdue University, instructor in farm management, and W. L. Powers assistant professor of irrigation and drainage and superintendent of the irrigation demonstration farm.

Pennsylvania College and Station.—W. G. Ross has resigned as assistant professor of agronomy to accept the position of superintendent of farms for the Western Penitentiary of the State, and is succeeded by W. H. Darst of the extension department of Ohio State University. Joseph F. Cox (Ohio, 1912)

has succeeded W. W. Reitz as assistant in agriculture. J. D. Harlan, a 1912 graduate of the college, has been appointed assistant in experimental agriculture, E. L. Anthony assistant in dairy husbandry, and David E. Warner assistant in poultry husbandry.

Tennessee University and Station.—About 100 students are enrolled in the agricultural course, constituting the largest attendance thus far registered. A series of 8 short courses of one week's duration, to be held at various points in the State, was begun October 28.

Drainage investigations upon three distinct types of soil in the State to depths of from 1 to 6 feet, and treatment with lime and manure, are being inaugurated. The station and its substation at Jackson are to feed experimentally over 150 steers this winter.

J. E. Toomer, assistant chemist of the station, has resigned and has been succeeded by L. G. Willis of the Pennsylvania Station.

Vermont University.—R. T. Burdick (Cornell 1912) has been appointed instructor in agronomy.

Washington College and Station.—Ten extension schools are to be held this year. Dr. R. Kent Beattie has resigned as professor of botany and bacteriology to accept a position with the Forest Pathological Investigations of this Department.

Wyoming University and Station.—The trustees have authorized the construction of a $100,000 building to house the agricultural instruction in the university and the laboratories and offices of the station. The building is to be of fireproof construction, with 3 stories and full basement. The basement will be a laboratory floor for agronomy, entomology, farm mechanics, etc., and will contain an agricultural museum. The main floor will house the offices of the director, animal husbandman, agronomist, and the library. A lecture room will be provided upon the second floor to accommodate 150 students, as well as laboratories for research, chemistry, biology, parasitology, and pathology. The third story will be occupied by the chemical department for instruction and the work of the pure food commission.

Tenth International Congress of Agriculture.—The next meeting of this congress is announced for June 8 to 13, 1913, in connection with the International Exposition at Ghent, Belgium. The congress will be organized into sections of (1) rural economy, (2) the science of agriculture, culture of special crops, and agricultural education, (3) cattle breeding, (4) agricultural engineering, and (5) forestry. Papers should be submitted by January 1, 1913, and may be in French, German, or English and should be accompanied by brief abstracts in French. Mr. Jules Maenhaut, president of the Société Centrale d'Agriculture of Belgium, is president of the executive committee, and Mr. Paul de Vuyst, director-general of the Rural Office, 22 Avenue des Germains, Brussels, is general secretary.

The third International Congress of the Associations of Agricultural Women will be held at Ghent, June 13 to 15. This congress will be organized into three sections, namely, agricultural women's associations, the professional rôle of agricultural women, and agricultural women in the rôle of the mother and the manager. Mrs. John T. Burns, Lethbridge, Alberta, is representative from North America. Miss Van Aarschot, 38 Rue du Pépin, Brussels, is treasurer, and applications for membership should be sent to her.

The second International Congress of Home Training will follow these meetings, on June 15 to 17.

EXPERIMENT STATION RECORD.

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Provision for aiding and strengthening the great national industry of agriculture through a central agency was slow in coming in the United States. With a separateness which was long characteristic the States were left to their own devices, and it was not conceived to be the policy of the General Government to concern itself with the subject. Its vast public domain, much of which was then considered useless for agriculture, was in charge of a land office whose functions were restricted to its survey and record and disposal under federal laws.

As early as 1796 the suggestion of federal aid for the promotion of agriculture was made by President George Washington, who laid before Congress a plan for an agency modeled after the British Board of Agriculture, of which he was an honorary member. But Congress failed to act on this suggestion, as it did on a similar proposal which came from the Agricultural Society of Berkley, Mass., in 1817.

In the course of time, however, the use of public funds for agricultural work began to be practiced, plants, seeds and animals being introduced through the Consular Service and turned over for distribution to the Patent Office, which was then under the State Department. When Henry L. Ellsworth, a practical Connecticut farmer, became Commissioner of Patents in 1836, he gave special attention to the distribution of seeds and plants, and in 1839 he secured a Congressional appropriation of $1,000 " for the purpose of collecting and distributing seeds, prosecuting agricultural investigations, and procuring agricultural statistics."

Commissioner Ellsworth gave in his report for 1842 a prophetic view of what the application of science would mean to agricultural production. But there were many doubters, not only of the value of science as applied to agriculture, but also of the desirability of government aid to agriculture. This is evidenced by fluctuating appropriations, which at times were cut off entirely. After the Patent Office was transferred to the Interior Department, in 1849, the appropriations increased, a chemist, botanist, and statistician were employed, meteorological data were regularly furnished by the Smith-

sonian Institution, and information on many agricultural subjects was published in the annual reports. In this period the principle was gradually established of governmental promotion of agriculture, not only through the distribution of seeds, but through the employment of science.

With the coming of Lincoln's administration a plan was put forward by David P. Holloway, Commissioner of Patents, for the creation of "a department of the productive arts." Congress adopted a portion of the commissioner's plan and established a department of agriculture, President Lincoln signing the act May 15, 1862. The new department was formally organized on July first of that year, in the rooms of the Patent Office previously occupied by the agricultural division; and on the following day, July 2, President Lincoln signed the Morrill Act.

Thus it came about that the provision of a national agency for agriculture and of federal aid for the establishment of agricultural education, both of which had long been urged, were realized at the same time, and at a time when the country was in the midst of its mighty struggle for union. It is worthy of note also that on May 20 of that year President Lincoln set his approval on the Homestead Act, culminating an agitation for the settling of the public lands which had been a national issue for ten years previous. It is remarkable that these three events, which have been of such fundamental importance to the agriculture of this country, should all have been culminated within a period of less than six weeks.

From these small and uncertain beginnings, there has resulted in the period of fifty years since the Department of Agriculture was formally established an organization for the administration of law, prosecution of research, and the collection and dissemination of knowledge "the like of which is unknown in any other country or any other time."

The history of the rise of the Department through successive commissioners and secretaries, its elevation to the first rank in the executive branch of the Government in 1888, and its present magnitude and scope, were sketched in the interesting address of Dr. A. C. True at the Atlanta convention of the Association of American Agricultural Colleges and Experiment Stations in November. It was the only observance of this important anniversary. Anniversaries of events of far less import to the American people have been observed in a national way, in a manner to draw public attention to them and emphasize their epoch-making character.

Appreciation of the Department's work and position has come mainly in quite recent years. Until then it was known to many as an agency for the distribution of free seeds, and it had little standing as an institution for agricultural investigation. Its larger growth

is a notable triumph of agricultural science. Nothing else could have given it the dignified standing and the confidence which it now enjoys. The demonstration of science as the fundamental basis of agriculture, of its ability to cast aside the cloak of tradition and superstition and mystery which enveloped it, and to provide an intelligent and reasoning basis for practice, has placed agriculture as an industry on a very different footing in the eyes of the people, as it has also the institutions representing it. Nothing has done so much to impress upon the public the intimate and helpful relation of science to daily life, to educate it to the belief in science as something very real and essential and for universal use, rather than something abstract and incomprehensible and for the pursuit of the few.

In a recent address Dr. David Starr Jordan expressed some thoughts which are well worth considering in this connection, for, although he was speaking primarily of medicine, his deductions are especially applicable to the subject under discussion. After laying down the principle that all art is based on science, and defining science as "human experience tested and set in order," he said:

"Art is knowledge in action, and art which is not based on knowledge becomes a mystery or a trade. The practice of medicine [or agriculture] through the ages has been one or the other or both. It is a trade when the physician's [farmer's] apprentice follows his master about, learns his ways, his prescriptions, and his professional dignity. It is a mystery when practice is based on some theory . . . which goes outside of human experience for its justification. Science is alike to all men who have grasped its data and its conclusions. Art will vary with the personality of the individual who practices it."

Agriculture and the practice of farming have passed through the stage of mystery to that of a trade with professional aspects. Modern scientific agriculture aims to replace tradition with well-established facts. While the art varies with the individual who practices, it is now based on knowledge, i. e., on experience viewed in the light of science. This is its essential characteristic, and the ability to call science into the service of agriculture is a modern accomplishment.

The limitations of experience unaided, and its inadequacy to progress, were well set forth by Dr. H. C. White in his Atlanta address on the American Experiment Stations. The application of original investigation to supplement and extend the experience and observations of daily life marked a new era in the acquisition of knowledge.

Dr. White said: "When Patrick Henry declared that he knew of no lamp by which to guide his feet but that of experience, he spake as a man of the eighteenth century and those which had gone before. For untold centuries individual and traditional experience was counted the safest if not the only guide to conduct. In the great industry of agriculture, in which men had been engaged since the

beginning of human history, experience in like manner had been the school in which instruction had been sought for proficiency in the art and improvement of its processes. The value of experience surely is not to be disdained. On the contrary it is a very efficient corrective of error, and men do well to maintain its historic continuity for the avoidance of fault and the elimination of blunder.

"But while experience may be safe, it is after all but an unintelligent and unprogressive monitor. Certainly in the case of agriculture it has proven its inadequacy to progress. For it may be doubted if agricultural practice or agricultural production in Europe in the eighteenth century were in any large degree superior to those of ancient Babylonia, Egypt, Greece, or Rome. It was only when the truly scientific spirit of inquiry into the causes and reasons of phenomena was loosened upon the world that conduct and practice could be based upon an illuminating knowledge and no longer guided by a blind experience."

There is little in mere handicraft that can be taught; it must mostly be acquired by experience. Hence the development of such agencies as the agricultural colleges and the Department of Agriculture waited largely on the development of the scientific stage and the explanation of the principles involved. With the application of science and its dissemination, all of these agencies grew in power and resources and size, so that in a remarkable degree they are to be regarded as products of their own activities. The great industry of agriculture has developed with them and very largely as a result of them, and to them is unmistakably due the present position of agriculture as an industry and its efficiency as an occupation.

But there were other conditions in this country which retarded for a time the higher development of agriculture and had a great influence on the progress of these agricultural institutions. Among these were the operations of the Homestead Act, which, as we have seen, came into effect at the same time that the Department and the agricultural colleges were provided for. Other conditions were economic in their nature, and these we are still struggling with.

The Homestead Act promoted on a vast scale the rapid expansion of our agriculture, causing the occupation of the available farm land in a half century and distributing this land among millions of small proprietors. This brought about the production of enormous wealth as the basis for the development of commerce, manufacturing, education and social life. It broadened our more conservative and substantial electorate to such an extent as to enable us to meet the problems arising from vast combinations of capital and labor, so that today we have a fair opportunity for their successful solution.

Looked at from another angle, the Homestead Act brought about conditions which prevented for many years the proper development

of agricultural education in our colleges and schools, and hindered the progress of the Department of Agriculture and the experiment stations. As long as there was plenty of free land and agriculture was being spread out by the simplest methods beyond the immediate needs of the nation, although the aggregate of agricultural production greatly increased, the price of agricultural products constantly tended to fall below the level of profit. Agriculture thus became a backward and depressed industry. The generation of pioneer farmers who had rushed in so eagerly to acquire the free lands became disgusted with the financial outcome and outlook of this business, and sought every avenue of escape from it for their children. Hence the agricultural colleges, begun with much enthusiasm, found little support from the farmers, and after a time began to lose even the meager number of students at first attracted to them.

The Department of Agriculture and the early experiment stations had little encouragement to collect the knowledge on which alone efficient courses in agriculture could be constructed, and remained in a weak and neglected condition. Fortunately there were leaders who saw that this condition of affairs could not last, and that the time would come when the farmers would need help and be eager to receive it. The passage of the Hatch Act, twenty-five years ago, marks the turning of the tide.

In commenting on the change of conditions which has come with passage of years, Dr. True said:

"From being a simple and depressed industry, agriculture is becoming a highly complicated and progressive industry. The universal use of machinery, the necessary changes in methods, crops, and animal husbandry, to meet the new and varied demands of different regions, have caused an unparalleled reorganization of agricultural industries. The many successful applications of science to agriculture, and the evident need of technical education in agricultural science and practice, have caused the establishment in the United States of the most comprehensive and farreaching system of agricultural research and education ever devised."

The Department is approaching the close of four successive administrations under the same guiding hand, a period of sixteen years of marvelous growth and development which have far surpassed the combined product of all the previous years. Some of the facts of this growth are brought together in the last annual report of the Secretary of Agriculture, in a retrospect which furnishes a basis for measuring the present scope and diversity of this national agency. These are only faintly indicated by its present income of $24,743,044 and its force of 13,858 employees.

The present functions of the Department may be broadly classified as (1) administrative, (2) advisory, (3) investigational, (4) informational, and (5) educational. These have been so far developed and expanded that the Department's business vitally affects the daily life of all our people.

Under administrative duties are included those relating to the enforcement of the meat inspection, carried on at nearly one thousand establishments in two hundred and fifty-nine cities and towns; the inspection of foods and drugs, insecticides and fungicides, with regard to both domestic and imported products, which is conducted through the laboratory of the Bureau of Chemistry at Washington and its twenty-five branch laboratories throughout the country; the control and quarantine rendered necessary by sheep and cattle diseases and the inspection of cattle-carrying vessels; the management of the national forests, embracing one hundred and eighty-five million acres, or nearly three hundred thousand square miles of territory; the regulation of interstate commerce of game animals and the control of the importation of noxious and other animals; the Congressional seed distribution; the supervision of the federal funds granted to the state experiment stations; and the direct management of stations in Alaska, Hawaii, Porto Rico, and Guam.

In its advisory capacity, the Department conducts a vast and varied correspondence. Besides this there are some large operations which have in them an important advisory factor. Such, for example, are the daily weather forecasts, the monthly crop reports, the national soil survey, and the cooperative farm demonstration work. Many agents of the Department are now giving much of their time to personally advising the farmers in the districts where they are located. Notable examples of this are the services of the Department's road, irrigation, and drainage engineers. In a similar way this Office has a broad influence on the development of the agricultural colleges, schools, and experiment stations.

The technical, scientific, and practical investigations of the Department now constitute a large share of its business and cover a very wide range. All of the bureaus are engaged in this work, and their projects cover practically every department of agricultural inquiry. They include laboratory investigations in the various sciences bearing on agricultural problems, field experiments in many States and Territories, studies of natural conditions and agricultural possibilities on a large scale, the exploration of foreign countries for plants, beneficial insects, etc., the devising of means to defend the farmer against flood or to protect him against the ravages of insects and diseases, engineering studies on road building, irrigation, and drainage, economic studies relating to farm management, cost of production, etc., etc.

Taken together, these projects constitute the largest amount of definite and systematic investigation, agricultural or otherwise, conducted under a single organization anywhere in the world. United with the similar work of the state experiment stations, they are accumulating a body of knowledge relating to agriculture which already constitutes by far the largest contribution to the science of agriculture. In this way a broad, sure, and permanent foundation for the future agricultural prosperity of the United States is being laid.

As perhaps a natural outgrowth of its functions relating to the industry which is most fundamental to human life and civilization, the Department has taken on an increasing amount of work outside the field of agriculture. Such, for example, is a large part of the meteorological work of the Weather Bureau, the inspection of drugs, investigations on human nutrition, studies of household and disease-causing insects, biological investigations relating to human diseases, etc. Part of this has been given to the Department under a wise administrative policy which seeks to make the most effective use of existing governmental agencies and facilities, instead of creating new ones.

As a public agency for the dissemination of information on agricultural subjects the work of the Department has reached vast proportions. During the year ended June 30, 1912, it issued 2,110 publications, aggregating 34,678,557 copies. Many of these are technical reports of scientific investigations, published in small editions, but others are popular in character and are widely distributed. Over nine million copies of Farmers' Bulletins are sent out annually, and as they are distributed largely through Congressmen they go into all the rural districts. The "Yearbook," a bound volume of about seven hundred pages, has an edition of a half million copies.

For many years past three technical periodicals have been issued—the Monthly Weather Review, the Crop Reporter, and Experiment Station Record. These are given wide distribution in this country and to a considerable extent abroad. In addition, the Bulletin of the Mount Weather Observatory is issued in a periodical series, and the Library puts out a Monthly Bulletin.

Included in the special equipment of the Department are three farms, one at Arlington, Va., of about four hundred acres, for plant work; another of about fifty acres at Bethesda, Md., for use in the study of animal diseases; and a comparatively new farm at Beltsville, Md., of four hundred and seventy-five acres of land, for experiments in animal husbandry and dairying.

The Department's Library contains a collection of 122,000 books and pamphlets, chiefly on agriculture and related sciences, and as far as known is the largest agricultural library extant. Nearly two thou-

sand periodicals are received currently. Its books are lent to workers all over the country, loans being made the past year in thirty-nine different States and Territories, serving in this way as a national library of agriculture.

Such is the present magnitude of the national department which stands for agriculture and for the broader relations of human welfare. It is no local institution but is national in the broadest sense. Its constituency is ninety million people who profit by its manifold activities in a thousand ways, and its field is every State and the island possessions, through which its local offices and laboratories and over eleven thousand of its workers are scattered. It has no regard for sectional divisions or political affiliations. Nor does it work unto itself, for in these years of development the principle of cooperation between the Nation and the State has been permanently established.

The past sixteen years is a remarkable record of growth in resources and responsibilities and lines of endeavor, a growth in which the personnel has been multiplied more than five times and the revenues nearly seven times. This has been built upon a confidence born of accomplishment and a widening view of the functions of the Federal Government.

The history of the experiment station movement in the United States has often been told in these pages and in other publications. Dr. White, in his admirable paper, reviewed this history in the light of contemporary conditions of agriculture and of science, and gave a forecast of future development.

Starting with the establishment of the first experiment station in Connecticut in 1875, the growth of stations under state patronage was slow and their revenues comparatively small up to the time when the movement became national. These pioneer stations, however, demonstrated the usefulness of such institutions and prepared the public mind and the national legislature for the important step which culminated in the passage of the Hatch Act on March 2, 1887. They furnished a vision and an imagination which enabled a foreshadowing of the work to be done.

The inadequacy of the existing basis for agricultural instruction had been realized by the agricultural colleges for several years, as had been the inability of the colleges under their limited organization to develop that basis as it should be. A convention of representatives of the land-grant colleges, held in Washington in 1883, approved a plan for the establishment of a station at each of the colleges, and a subsequent convention in 1885 reaffirmed this approval. Several bills providing federal appropriation were presented in succeeding Congresses, and strongly pressed by the agricultural colleges and the then existing experiment stations, but it was not until

1887 that a bill introduced by Hon. William H. Hatch, of Missouri, was enacted by Congress and approved by President Cleveland. Thus came into existence, a quarter of a century ago, that great arm of the public service, the American agricultural experiment station, which in this relatively short period has given such an impetus to agricultural education and to a more intelligent agriculture, and been a national force for the instruction of the farmer.

The stations were regarded as state institutions from the beginning, and this subjected them to local conditions, pecuniary, political, and administrative, which for a time retarded their proper development in some instances. In the early period "it was inevitable that there should have been more or less of groping after stability and accurate consciousness of purpose. There was undoubtedly much effort that was unwise, much labor that was useless, much duplication that was unnecessary, much wastefulness of both energy and means."

Gradually, however, these conditions were remedied. Greater stability prevailed. The true mission of the station, the necessity for freedom from interference and large liberty in developing its methods and conducting its studies, were recognized and secured. As time passed and their potential capabilities were made manifest, the need developed for larger appropriations and for a more fundamental character of investigation. "In the first place, their resources were inadequate to their needs. States and communities had not yet been quickened to a sufficient supplementing of the initial federal grants. In the second place, the time had arrived when mere experimentation for the repeated corroboration of fairly well established truths should largely cease, and research and investigation for the acquiring of new and larger truths be more extensively prosecuted."

This resulted in the passage of an act introduced by Henry Cullen Adams, of Wisconsin, which was signed by President Roosevelt March 16, 1906. This new act doubled the federal appropriation to the stations in a period of five years, the federal appropriation reaching $30,000 to each State in 1911, or a total of $1,440,000 a year. Its terms were so drawn as to restrict the use of the new appropriation to the conduct of original investigation and research, as distinguished from the simpler experiments and trials which had been so much in demand. The standards set soon affected the work of the stations as a whole, resulting in a higher grade of product, and led to a sharper definition of their duties as distinguished from those of the teaching departments of the college and the manifold enterprises for extension teaching. The new provision called for more thoroughly trained men; and the differentiation of duties, with the larger freedom for concentration on research, attracted a class of workers who had heretofore looked askance at the experiment station as a field of activity.

Reviewing this new era, Dr. White said: "In the six years since the passage of the Adams Act the work and utility of the stations have enormously increased and expanded. Desultory and inconsequent experimentation has been largely discontinued; definiteness in experiment work has been more clearly established, and genuine scientific research along all the lines of the natural sciences related to agriculture have been begun. A large and able body of competent investigators has been developed, and the quality and value of their work challenges admiring comparison with the output of the laboratories of the world devoted to pure research in all the branches of biology, chemistry, and physics. Through the station publications and otherwise a body of new truth, demonstrated or suspected, has been given immediately to the workers in the fields for adoption, scrutiny, or test, and as a result it is probably true that in America scientific agriculture—and that means intelligent agriculture, economic agriculture—has made greater progress in the last ten years than in all the years which went before."

In the six years since the Adams Act passed, the revenues of the stations from federal and state sources have nearly doubled, amounting in the fiscal year 1912 to practically $3,850,000, while the staff of officers and workers has increased nearly 85 per cent, the rolls at the close of 1912 numbering no less than 1,750 persons.

Dr. White outlined the modern conception of the experiment station as that of "a scientific laboratory in the fullest and purest sense, given over to varied but purely scientific work, with fields and barns and herds ranking with microscope, balance, and burette as mere implements of research. It is experimental only so far as it may test, on a strictly laboratory scale, the suggestions of research. It is the investigative department of the college to which it may be attached and, as such, may be called upon only to furnish new truths to be taught in the class room and the laboratory, in the extension lecture and on the demonstration farm. With this distinctive and restricted purpose the field of its operation is yet ample and sufficient. . . .

"The acquisition of knowledge must precede its application, and further real progress in agriculture must, therefore, come not so much from improved instruction in the schools, from increase in our extension teaching, or from demonstration in the field, valuable and important as these may be, but mainly from research in the station laboratory. . . .

"And yet a greater service may the station render to the State. Among all the public institutions, it should stand preeminently to illustrate the persistent, untiring search for truth. . . . For it is the search after truth that is the basis of moral training, and it is the possession of truth that, alone, shall make us free."

Throughout the last quarter century of development, the Department of Agriculture has been in close cooperation with the Association of American Agricultural Colleges and Experiment Stations and the institutions represented in it. There has also been a constant interchange between them. One secretary and three assistant secretaries have come from the agricultural colleges and experiment stations. Numerous subordinate officers, especially in the scientific service, have been drawn from these institutions, where they have received their special training. On the other hand, many Department officers have gone into the faculties of the agricultural colleges and the staffs of the experiment stations. Constantly increasing, and in the aggregate large, amounts of Department funds have been used in cooperation with the colleges and stations in a great variety of enterprises.

This is a natural and a happy condition, a recognition of the fact that problems and principles are broader than institutions or men, and that in their common effort for the advancement of agriculture through investigation and demonstration the facilities of the National Department and the state experiment stations supplement each other. Each has shared in the other's progress and achievements, and the success and influence of the one can rarely be adequately measured without recognition of the other.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Phytin and pyrophosphoric acid esters of inosit, II, R. J. ANDERSON (*New York State Sta. Tech. Bul. 21, pp. 3–16*).—Continuing previous work (E. S. R., 27, p. 406), the author describes as new salts of phytic acid, calcium-magnesium-potassium phytate, penta-calcium phytate, tetra-calcium phytate, penta-magnesium phytate, the copper salts obtained when precipitating phytic acid with copper acetate, octa-silver phytate, and hepta-silver phytate. "Efforts to synthesize phytic acid by acting on dry inosit with dry pyrophosphoric acid lead to the formation of esters. Two of these, viz, the di-pyrophosphoric acid ester of inosit and a di-inosit tri-pyrophosphoric acid ester were obtained in pure form and analyzed. These esters are very similar to phytic acid in appearance, taste, and reactions. They yield similar acid salts and on hydrolysis inosit and phosphoric acid are produced."

The study was conducted in conjunction with an investigation in regard to the form in which phytin exists in wheat bran, and which will be reported upon later.

Studies on enzym action.—I, Some experiments with the castor bean lipase, K. G. FALK and J. M. NELSON (*Jour. Amer. Chem. Soc., 34 (1912), No. 5, pp. 735–745*).—A comparative study was made of the hydrolysis of methyl acetate, ethyl butyrate, and olive oil caused by the castor bean lipase. Adding small amounts of alkali at the beginning of the action had no appreciable influence on the subsequent hydrolysis with methyl acetate, but with ethyl butyrate the action was different, depending upon the amounts of alkali added.

"In ether saturated with water, and acetone containing a small amount of water, as solvents, methyl acetate was hydrolyzed to a considerable extent with lipase both at the ordinary and at more elevated temperatures. Small amounts of an active constituent were extracted from the lipase preparation by water and by ethyl acetate. By the electrolysis in water of the lipase preparation, a substance was produced in the anode solution, probably by oxidation, showing marked hydrolytic action."

Rôle of electrolytes in the action of ferments of animal origin, H. BIERRY (*Biochem. Ztschr., 40 (1912), No. 5–6, pp. 357–369*).—It was found that the pancreatic and gastric juices of dogs lost their starch-hydrolyzing property when subjected to dialysis with distilled water. The presence of chlorin or bromin ions was found to be absolutely essential to the activity of animal amylases. Vegetable amylase and lactase, and emulsin of animal origin, retain their cleaving power even when chlorids are absent.

The hydrolytic action of hydrogen peroxid, C. NEUBERG and S. MIURA (*Biochem. Ztschr., 36 (1911), No. 1, pp. 37–43*).—The preparations used in this work were ovalbumin, gelatin, glycogen, various starches, inulin, nucleic acid from yeast, the sulphuric acid salt of chondroitin, and lecithin. Marked cleavage was noted at ordinary temperatures with all of these substances.

The ignition of precipitates without the use of the blast lamp, P. H. WALKER and J. B. WILSON (*U. S. Dept. Agr., Bur. Chem. Circ. 101, pp. 8*).—"An attempt has been made to determine whether alumina and silica can be ignited to constant weight without the use of a blast lamp, and as a result the authors are of the opinion that with slow initial ignition and final heating at the highest temperature that can be obtained with a burner, silica is practically always reduced to constant weight in 2 hours and generally in 1 hour. Alumina requires a somewhat longer period. About 3 hours reduces the weight to within the limit of error of the determination."

Precipitating agents for amino acids, C. NEUBERG and J. KERB (*Biochem. Ztschr., 40 (1912), No. 5–6, pp. 498–502*).—A universal precipitating agent for amino acids was found in a solution of mercuric acetate made alkaline with sodium carbonate. If to a solution of glycocoll, a saturated or a 10 per cent solution of sodium carbonate is added to alkalinity and then followed with a 25 per cent solution of mercuric acetate a white precipitate is obtained. By the judicious addition of the reagents in turn and then alcohol, a dense white precipitate is produced which is nearly quantitative. The process consists not only in obtaining the mercuric salt of the amino acid but also represents a complicated reaction in which the elements which constitute carbon dioxid come into play. Probably the basic salts of the corresponding carbamic acids are involved. The method does not possess the sharpness or definiteness of phosphotungstic acid with the diamino acids.

A delicate method for determining minute quantities of chlorophyll, C. A. JACOBSON (*Jour. Amer. Chem. Soc., 34 (1912), No. 9, pp. 1266–1269, pls. 4*).—A description is given of a method for determining the quantity of chlorophyll in leaves with a green weight less than 1 gm. This consists of a comparison of the intensity of the chlorophyll absorption bands of the solution to be examined with the intensity of the corresponding bands produced by solutions of known concentrations.

Colorimetric determination of phosphoric acid in arable soils, C. R. HERRERA (*An. Inst. Méd. Nac. [Mexico], 10 (1908), pp. 271–276; abs. in Chem. Abs., 6 (1912), No. 5, p. 662*).—The method is as follows:

"Twenty gm. soil, dried at 110°, are heated to low redness in a platinum crucible to destroy organic matter and digested with nitric acid on a water bath for 5 hours with frequent shaking. The filtered solution is evaporated to dryness in a platinum dish, the oxids of iron and aluminum dissolved in 5 cc. each of nitric acid and water, and filtered from silica. The temperature should be kept below 120° in order to prevent formation of alkali and alkaline earth silicates which would later form silicomolybdates. The filtrate is precipitated with ammonium molybdate, the precipitate dissolved in ammonia and, after addition of potassium ferrocyanid, compared with a standard solution prepared from pure acid sodium phosphate. Citrate-soluble phosphoric acid may be determined in a similar manner."

Determination of moisture in cereals and cereal products, A. FORNET (*Ztschr. Gesam. Getreidew., 3 (1911), Nos. 4, pp. 92–98; 5, pp. 113–118; 4 (1912), No. 3, pp. 73–77, figs. 3*).—This is a study of methods. It considers the various temperatures and apparatus proposed for determining the moisture in cereals and cereal products, and also points out their disadvantages, particularly the Duvel (E. S. R., 18, p. 1122) and Hoffmann apparatus.

The author also describes a rapid drying apparatus, which utilizes a current of air and a temperature of 160° C. He finds that working under these conditions the apparatus will furnish results in from 7 to 14 minutes, depending upon the material under examination, which are practically identical with

those obtained by drying at 105° for 15 hours or so. A scale devised by the author for rapid weighing is also illustrated and described.

The determination of sugar in natural substances, C. NEUBERG and M. ISHIDA (*Biochem. Ztschr., 37 (1911), No. 1–2, pp. 142–169; abs. in Zentbl. Physiol., 25 (1911), No. 25, pp. 1199, 1200*).—The polarimetric determination of sugar in all cases is connected with a certain amount of error where optically active substances (cleavage products), such as peptone, amido acids, amins, etc., are present, as they are as a rule in human foodstuffs, but if the solution containing them is first treated with mercuric acetate and then with phosphotungstic acid interfering substances will be removed. The author first adds a 50 per cent solution in water of mercuric acetate until no more precipitation takes place, filters off the sediment, and then adds a 25 per cent aqueous solution of phosphotungstic acid until no more precipitation occurs. Care must be taken not to add a large excess of mercuric acetate. No sugar is retained in the precipitate, and that in the filtered fluid may be determined by either the reduction or the polarimetric method.

In regard to the composition of Fehling's solution as used at the present time, O. LÜNING (*Chem. Ztg., 36 (1912), No. 14, p. 121*).—Attention is drawn to certain inaccuracies in several of the published directions for preparing Fehling's solution.

The amount of formic acid in honey, H. FINCKE (*Ztschr. Untersuch. Nahr. u. Genussmtl., 23 (1912), No. 6, pp. 255–267; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 8, p. 402*).—Continuing previous work (E. S. R., 26, p. 312), honey was not always found to contain formic acid, but most of that examined contained a volatile acid which reduced mercuric chlorid in amounts varying from 0.003 to 0.02 per cent when calculated as formic acid. This acid was present in both the free and combined state. Esters of formic acid could not be detected.

Attention is called to the fact that small quantities of formic acid are obtained if invert sugar is distilled with steam, the quantity depending upon the acidity of the solution. Sucrose when inverted with invertase does not yield formic acid on distillation. Honeys free from formic acid were not found to yield any more volatile acids than those derived from a corresponding amount of invert sugar.

The analysis of vinegar, J. H. PATERSON (*Proc. Univ. Durham Phil. Soc., 4 (1911–12), No. 3, pp. 144–146*).—Normal vinegar contains acetic acid, and small quantities of sodium tartrate and acetate. If the acetic acid is titrated with a standard alkali solution, and the solution then titrated back with a standard acid solution, using methyl orange as an indicator, the amount of acid will be, therefore, a little in excess of that which would be equivalent to the free acid found by the alkali titration. Vinegar adulterated with mineral acid will not contain tartrates and acetates, but free acetic and tartaric acids will be present.

The method used is as follows: "A sample of the vinegar is boiled under a reflux condenser with about $\frac{1}{8}$ of its weight of animal charcoal (the charcoal is previously treated with dilute hydrochloric acid to remove all carbonates, well washed, and dried for some time at 110° C.). The liquid is then filtered and the interior of the condenser washed into the filtrate with some of the filtered liquor. About 20 gm. of the filtrate are then weighed out and diluted to 100 cc. with distilled water. Portions of 25 cc. are carefully titrated with tenth-normal caustic potash, using phenolphthalein as indicator. The solution thus obtained is diluted to a known volume (about 100 cc.), and 6 drops of methyl orange added. Decinormal sulphuric acid is then run in until a pink color without any yellow shade is produced."

A blank of distilled water is then titrated in the same way, and the true volume of acid required for the back-titration of the sodium acetate obtained by difference. Solutions containing known amounts of acetic acid, sodium acetate, and sulphuric acid were analyzed by this method.

Analysis of paprika, A. DE SIGMOND and M. VUK (*Kisérlet. Közlem., 14 (1911), No. 5, pp. 757–792*).—The determination of the iodin number and the refraction of the ether extract will not detect adulterations of paprika with foreign oils. The standards of the United States require that paprika represent only the dried fruit of *Capsicum annuum*, while in Hungary the seeds are not excluded. As the seeds contain more oil, the United States standard of 15 per cent is exceeded.

Air-dried paprika contains more or less moisture, so that the results obtained should be compared on a dry basis. The results obtained by drying in a current of air differ markedly from those after drying in a current of illuminating gas. It is stated that Hungarian paprika can not be distinguished from foreign paprikas on the basis of a chemical examination.

Contribution to the detection of benzoic acid in foods and condiments, E. POLENSKE (*Arb. K. Gsndhtsamt., 38 (1911), No. 2, pp. 149–154*).—The author has elaborated a method for determining the total benzoic acid in red bilberries and in bilberry compote, and presents a method for the isolation and qualitative detection of benzoic acid in food products.

Determination of the total solids in milk, A. SPLITTGERBER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 22 (1911), No. 10, pp. 583–599; abs. in Chem. Zentbl., 1912, I, No. 5, pp. 377, 378; Jour. Soc. Chem. Indus., 31 (1912), No. 1, pp. 40, 41*).—What is deemed the most appropriate method for determining the total solids in milk consists in drying from 3 to 4 gm. of milk in a flat-bottomed dish with or without the addition of acetone or alcohol. The method yields results with normal, rich, skim, and watered milk, which compare well with the figures obtained by Fleischmann's formula. The ordinary water oven requires 1 hour for the process, while the Soxhlet oven needs only 30 minutes when a watery solution of glycerin (55 per cent) is used. The addition of 3 drops of acetic acid or formaldehyde to the milk before evaporation yields results which are too high. Old milks yield low results. "If the milk contains calcium sucrate or sodium carbonate, the quantity of total solids found by direct determination is unreliable, but in such cases the calculated figure may be relied on as trustworthy."

The chlorin content of milk, P. POETSCHKE (*Jour. Indus. and Engin. Chem., 4 (1912), No. 1, pp. 38–40*).—The chlorin determinations recorded were made by the author's method, which consists in removal of the fat and proteids with copper sulphate and sodium hydroxid. The filtrate is acidified with nitric acid and titrated by Volhard's method. Total solids were determined with the aid of a special pipette (E. S. R., 26, p. 806) devised to deliver 5 gm. of milk.

The average amount of chlorin found, expressed as sodium chlorid, was 0.17 per cent, and ranged from 0.112 to 0.335 per cent. The average ratio of sodium chlorid to ash was 1:4.5.

Titrating the milk directly for its chlorin content, as recommended by Richmond, gave erroneous results. Formaldehyde present to the extent of 1:500 in milk did not influence the results obtained with the author's method.

A rapid means for determining the fat in milk according to the Röse-Gottlieb method, E. RUPP and A. MÜLLER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 23 (1912), No. 7, pp. 338, 339*).—The author found that the separation of the ether can be accelerated by adding gum tragacanth to the mixture and shaking.

The detection of coconut fat in butter and lard, E. POLENSKE (*Arb. K. Gsndhtsamt., 38 (1911), No. 3, pp. 402–414*).—It appears that the method of Ewers (E. S. R., 23, p. 417) and Fendler (E. S. R., 23, p. 418) can not be used for this purpose. The Polenske method, on the other hand, will give trustworthy results. The results of examining 34 fresh and 8 old butters are given in detail.

Determination of fat in feeds by extracting in the cold, C. GRIMME (*Chem. Rev. Fett u. Harz Indus., 19 (1912), No. 1, pp. 1–5*).—As considerable danger from fire exists when using ether for extracting fats, tests were conducted with chloroform, carbon tetrachlorid, and di-, tri-, and per-chlorethylene, for determining their value as fat solvents for air-dry cotton-seed meal.

Carbon tetrachlorid and tri-chlorethylene were the only reagents which gave results comparing well with those obtained with ether. The method finally adopted was as follows: Ten gm. of the air-dry sample is shaken with 100 cc. of either carbon tetrachlorid or tri-chlorethylene for ¾ hour in a 150 cc. flask in the cold and with the aid of the shaking machine. After allowing the insoluble particles to settle for 30 minutes, 50 cc. of the filtered fat solution is freed from the solvent by distillation and then dried for about 1 hour (by occasionally blowing air over it) at a temperature of 105° C. Multiplying by 20 the figures obtained gives the percentage of fat in the feed, providing the material did not contain more than 10 per cent of fat. If more fat is present corrections should be applied, viz, for 15 per cent fat +0.2 per cent, and for 20 per cent fat +0.4 per cent. The method gave good results with cotton-seed meal, peanut cake, peanut meal, rape cake, sunflower cake, coconut cake, soy-bean meal, linseed meal, bran, rice-feed meal, fish meal, corn meal, wheat germs, and rye bran.

Grading rosin at the still, F. P. VEITCH and C. F. SAMMET (*U. S. Dept. Agr., Bur. Chem. Circ. 100, pp. 4, fig. 1.*)—A method is proposed whereby a producer can grade rosin at the still when it is made and which does away with the cutting of rosin samples. The method consists of pouring the liquefied rosin with an ordinary tin dipper into a mold made of ordinary roofing tin. When cool the samples can be compared with a set of standard types of rosin.

"By far too much low-grade rosin is being made. There are three chief causes for this: First, the presence in the gum in the still of considerable quantities of wood, bark, pine needles, charcoal, and dirt which, through carelessness, accident, or both, have gotten into the gum in the woods and the larger part of which remains in the still during distillation. . . . Second, excessive heating or prolonged heating of the rosin in the still at the close of distillation, largely for the purpose of removing all turpentine and water which it may contain. Third, the presence in the finished rosin of much finely divided foreign material, such as charcoal and earth mentioned above, due to faulty straining of the finished rosin. . . . Rosins which had been graded A, B, C, D, and E, when dissolved in turpentine or alcohol, carefully strained, and the solvent evaporated with heat, all grade higher, many of them F or better, thus showing that these rosins were graded low because of the foreign material they contained, which had not been removed in straining, rather than because of the color of the rosin itself."

Oil from plants belonging to the order Papilionaceæ, C. GRIMME (*Pharm. Zentralhalle, 52 (1911), No. 43, pp. 1141–1149; abs. in Chem. Zentbl., 1911, II, No. 23, pp. 1739, 1740; Jour. Soc. Chem. Indus., 30 (1911), No. 24, p. 1460*).—The following seeds were examined for their oil content: *Cicer arietinum, Pisum sativum, Vicia faba, V. sativa, V. sepium, Lens esculenta, Cajanus*

indicus, Phaseolus mungo, P. vulgaris albus, P. coccineus, P. lunatus, P. inamœnus, Dolichos lablab, Vigna catjang, Canavalia ensiformis, and *Voandzeia subterranea.* Physical and chemical constants are reported, and the fatty acids were also studied. All the oils were nondrying in character.

Heat of combustion of bagasse from Hawaiian cane, R. S. Norris (*Hawaiian Sugar Planters' Sta., Agr. and Chem. Bul. 40, pp. 5–23*).—Using an Atwater modification of the Berthelot bomb, the thermal value of fiber from leading varieties of Hawaiian cane was determined, primarily for the purpose of ascertaining whether the variation in the amount of steam obtained in factories when different kinds of cane are being ground is due to the thermal value of the bagasse used for firing.

"The results are practically the same as those obtained for the thermal value of cane fiber in other countries as [summarized] and show conclusively that the variation in the steam when different kinds of cane are being ground is not due to differences in the thermal value of the bagasse. The maximum thermal value found was 4,636 calories (8,334 B. T. U.) and the minimum 4,494 calories (8,089 B. T. U.)—a difference of only 3 per cent."

The 2 standard varieties of cane grown on the islands, Lahaina and Caledonia, were found to have high thermal values. The average thermal value of cane fiber grown at the station and on Hawaiian plantations was 4,600 calories, which is 100 calories more per kilogram than for the bagasse therefrom.

The carbon and hydrogen contents, respectively, were for the bagasse 48.13 and 5.63 per cent; for the fiber 48.9 and 6 per cent; for the rind fiber 48.75 and 5.85 per cent; and for the pith fiber 47.2 and 5.9 per cent. "The rind fiber was about 4 per cent higher in thermal value than the pith fiber. This would tend toward giving canes with stalks of small diameter a higher value than those with large stalks, but an examination of the results shows that this influence is overcome by other variations in the cane." The thermal value of fiber from nodes was found to be 1½ per cent higher than that from the internodes in the 2 standard varieties of cane in Hawaii.

On the basis of the values recorded the fuel values of various bagasses may be compared with one another, and bagasse with other fuels. Some figures for the thermal value of subsidiary fuels in cane sugar factories are also included.

A bibliography on bagasse as fuel is appended.

Sisal and the utilization of sisal waste, E. V. Wilcox and W. McGeorge (*Hawaii Sta. Press Bul. 35, pp. 24*).—Continuing previous work (E. S. R., 15, p. 244), the conditions of the sisal industry in Hawaii were reviewed, and a chemical study of sisal and henequen was made for the purpose of finding a means of utilizing the residue after decortication as a fertilizer, stock food, or as a source of industrial alcohol.

The nitrogen content of 6 samples of waste was found to vary between 0.45 and 1.35 per cent; potash from 0.69 to 6.38 per cent; phosphoric acid from 0.46 to 2.79 per cent. Ash analyses of the leaves showed that "the plant feeds most heavily upon phosphates, lime, magnesia, potash, and soda, and since nearly all this mineral matter remains in the waste the analyses strongly indicate the advisability of returning the waste to the soil as fertilizer."

To use it as a stock food also seems possible, although it is first necessary to bring it to a dry condition. Converted into an air-dry form the minimum figures obtained were moisture 5 per cent, protein 5.78 per cent, nitrogen-free extract 60.01 per cent, fiber 17.97 per cent, and ash 11.24 per cent.

The chemical composition of the sisal leaf was as follows:

Chemical composition of sisal leaves, calculated on a dry basis.

Constituent.	Sample numbers.					
	1	2	3	4	5	6
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Reducing sugars	12.49	18.68	10.45	20.03	7.48	18.50
Nonreducing sugars	5.58	17.32	27.77	7.56	7.33	2.69
Gums	35.14	15.67	23.48	23.72	34.58	38.51
Starch	.66	2.57	.66	1.80	.64	1.25
Pentosans	2.32	4.92	3.96	4.73	5.95	4.58
Nitrogenous matter	7.25	4.75	4.89	6.00	3.68	5.19
Resin	2.82	.83	1.84	1.53	1.57	1.93
Fiber	20.86	23.13	15.80	23.71	26.49	18.32
Ash (total)	14.42	8.53	9.16	9.14	11.83	14.76
Acidity	.....	4.42	3.48	3.94	1.56	.....

The sugars soluble in cold water were in every instance found to be apparently insoluble in alcohol. The sum of the water and alcohol-soluble substances were a fairly constant quantity in most cases. When the sugar content of fresh sisal leaves was high the percentage of gum was low. After such leaves were left in the laboratory for a month a considerable reduction of the total sugar content (from 36 to 12.14 per cent) and an increase in the gum content (from 15.67 to 39.53 per cent) took place.

The acid present in sisal was found to be lactic and the authors were not able to obtain a test for oxalic acid after boiling the leaves vigorously in water, but a faint test was obtained after boiling in a hydrochloric acid solution. Short leaves were found to possess a higher percentage of acid than longer ones.

"The sugar content of the fresh leaf varied from 2 to 7 per cent, making an average of 4.5 per cent, which theoretically would yield about 26 liters (or 6.5 gallons) absolute alcohol per ton of leaves. It is hardly conceivable that with such a sugar content this could be made a remunerative industry with the waste at hand."

Report in regard to the activities of the Pommritz Agricultural-Chemical Experiment Station, 1911, Loges (*Ber. Agr. Chem. Vers. Stat. Pommritz, 1911, pp. 8*).—This is the report of the activities of this station for the year 1911, including among other data analyses of dairy products, fertilizers, feeding stuffs, and miscellaneous materials.

International catalogue of scientific literature, D—Chemistry (*Internat. Cat. Sci. Lit., 9 (1912), pp. VII+960*).—The literature indexed in this publication (E. S. R., 24, p. 408) is mainly that published in the year 1909, but includes some articles from 1901 to 1908 which were received too late for insertion in previous volumes, and also some entries dated 1910.

METEOROLOGY—WATER.

The correlation between sunspots and the weather, A. Gockel (*Sci. Amer. Sup., 74 (1912), No. 1911, pp. 102, 103*).—The scientific evidence bearing on such correlation is reviewed. The correlation between sunspots and rain and between sunspots and terrestrial magnetism is considered to be established. It is also stated that the frequency of cyclones increases with the number of sunspots.

[Weather observations], M. A. Blake, B. D. Halsted et al. (*New Jersey Stas. Rpt. 1910, pp. 81–86, 272–276*).—Observations on temperature, precipita-

tion, and evaporation at New Brunswick during 1910 and previous years are reported and briefly discussed.

Weather report, W. H. Day (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 37 (1911), pp. 58–63*).—Tabular summaries are given of observations on temperature, precipitation, and length of the growing season at representative stations in Ontario during 1911. There is also a record of wind movement during the year at Guelph.

Swedish meteorological observations, 1911, H. E. Hamberg (*Met. Iakttag. Sverige (Observ. Mét. Suéd.) K. Svenska Vetensk. Akad., 53 (1911), pp. X+157*).—These are the usual meteorological summaries of observations made under the direction of the Central Meteorological Institute of Sweden.

Duration of sunshine and insolation at Stockholm and Häfringe, J. Westman (*K. Svenska Vetensk. Akad. Handl., 47 (1911), No. 8, pp. 38; abs. in Met. Ztschr., 29 (1912), No. 10, pp. 489, 490*).—Monthly and yearly sums of sunshine, total radiation, and vertical components of total radiation are given for Stockholm during 1907 to 1910 and for Häfringe for 1910.

Frosts in New York, W. M. Wilson (*New York Cornell Sta. Bul. 316, pp. 505–543, figs. 18*).—Conditions favoring the formation of frost and methods of protection which have been used with success are described with special reference to conditions prevailing in New York.

Electric Niagaras and recent storms, A. Laforest (*Jour. Soc. Nat. Hort. France, 4. ser., 13 (1912), Sept., pp. 572–574*).—Several instances are cited in which the Eiffel Tower, acting as a so-called electric Niagara, had no influence in dissipating hail storms.

Well water, R. Harcourt (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 37 (1911), pp. 71–73*).—Sanitary analyses of 34 samples of well water from different parts of Ontario are reported. A large proportion of the samples showed evidence of contamination.

SOILS—FERTILIZERS.

The soils of Oregon, C. E. Bradley (*Oregon Sta. Bul. 112, pp. 48*).—This bulletin reports the results of several years' work on the soils of Oregon and includes chemical analyses of a number of soil types from different parts of the State arranged by counties, and analyses of drainage waters from tanks under different cropping systems and fertilizers. Analyses of samples of water from the Columbia and the Willamette rivers are also reported.

"The soils grade from the rich black loams of the coastal plains and lower river courses of western Oregon to the extremely sandy soils of the eastern and the coarse granitic soils of the southern portion of the State, with many intermediate types. Volcanic rocks predominate in the northwest, and Oregon soils are largely derived from weathered basalt, diabase, and diorite, particularly in the eastern and western part of the State. In southern Oregon granites, limestones, and other metamorphic rock exist also and have, therefore, determined in part the mineral character of the soils of this section. Where the weathering process has taken place under humid conditions, as in western Oregon, clay loams rich in humus have been formed, while under the climatic influences of the arid or semiarid conditions of that portion of the State east of the Cascade range, a sandy soil has resulted."

It was found that there was little loss of the mineral elements by leaching, except in one case where considerable phosphoric acid was lost. Nitrogen was lost in appreciable quantities, particularly under summer fallow. This nitrogen loss was appreciably reduced by legume rotations.

It was found that, although the percentage of nitrogen remained practically constant under continued cropping for, in extreme cases, 25 years, there was a marked decrease in the carbon content.

"The loss of humus from these soils under the wheat-fallow system is a matter of serious import, and it would seem that methods for conserving this organic matter must be adopted if these soils are to maintain their productiveness."

Sandy soils of western and northern Michigan, J. A. JEFFERY (*Michigan Sta. Circ. 16, pp. 101–105*).—These soils range from the coarser dune sands, which possess little or no agricultural value, to the finer Miami sands.

"The Miami sands vary from soils that possess much intrinsic agricultural value to soils that can never be made profitably productive under ordinary methods of management." The possible cropping value is indicated by the original vegetation which the soils are supporting or have supported. Potatoes, clover, rye, buckwheat, and in some cases wheat, oats, and barley are the crops best suited to the soils. "Truck crops do well, corn and beans do fairly well. Alfalfa promises to prove a very valuable crop for these soils. They are not adapted to the growing of sugar beets."

Results of chemical studies of the cane soils of Java, T. MARR (*Arch. Suikerindus. Nederland. Indië, 20 (1912), No. 32, pp. 1251–1314, pls. 11, fig. 1; Meded. Proefstat. Java-Suikerindus., 1912, No. 23, pp. 653–714, pls. 11, fig. 1*).—This is a compilation of physical and chemical analyses, made by different investigators during the last 25 years, of a large number of samples of cane soils from various districts of Java. See also a note by Mohr (E. S. R., 25, p. 512). The report includes a discussion of the topographical features of the various districts, the character and distribution of the soil types, and the amount of plant-food constituents of the soils.

Soil mapping and geological-agronomic maps, W. KOEHNE (*Landw. Hefte, 1912, No. 5, pp. 32*).—This is a general discussion of the scope and purpose of geological-agronomic soil maps, with particular reference to their practical value and interpretation by the farmer.

The Mangum terrace in its relation to efficient farm management, J. S. CATES (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 94, pp. 11, figs. 9*).—The advantages and construction of the Mangum terrace worked out by P. H. Mangum of Wake Forest, N. C., are briefly described. It is a broad bank of earth contouring the field at a grade of approximately 1½ in. to 14 ft. Under ordinary farm conditions, the most practical way of constructing the terrace is by back furrowing along the grade line.

The advantages of this system are stated to be its adaptation to all types of soil, especially to moderately rolling lands, the possibility of using extensive cultivation machinery and cultivating across the terrace, the saving of labor and land, and the ease of preserving the terrace when once constructed.

Bacteriological studies of field soils.—I, The effects of lime, P. E. BROWN (*Iowa Sta. Research Bul. 5, pp. 189–210*).—Previous experiments (E. S. R., 26, p. 428) having dealt with the effects of ground limestone on certain groups of soil bacteria under greenhouse conditions, similar experiments were conducted under field conditions. The results of the work in general were similar to those already noted.

Bacteriological studies of field soils.—I, The effects of liming, P. E. BROWN (*Centbl. Bakt. [etc.], 2. Abt., 35 (1912), No. 11–13, pp. 234–248*).—This is an abridged account of investigations noted above.

Bacterial activities in frozen soils, P. E. BROWN and R. E. SMITH (*Iowa Sta. Research Bul. 4, pp. 157–184; Centbl. Bakt. [etc.], 2. Abt., 34 (1912), No. 14–17,*

pp. 369–385).—This is a detailed account of investigations which have already been noted from a briefer paper (E. S. R., 26, p. 816).

Relations of the plant to the nutritive elements of the soil: The law of minimum and the law of physiological ratios, P. Mazé (*Compt. Rend. Acad. Sci.* [*Paris*], *154* (*1912*), *No. 25, pp. 1711–1717, fig. 1; abs. in Rev. Gén. Agron., n. ser., 7* (*1912*), *No. 8, pp. 292–295; Jour. Soc. Chem. Indus., 31* (*1912*), *No. 14, p. 695*).—The author's experiments with maize and *Aspergillus niger*, using various kinds, amounts, and relative proportions of mineral substances in the culture solutions, led to the conclusion that the law of minimum, particularly as defined by Mitscherlich (E. S. R., 25, p. 825) is a purely speculative conception. The relation of the plant to its nutritive substratum is determined by complex conditions controlled by a law which is designated the law of physiological ratios, that is, the growth of the plant is determined not solely by the nutritive constituent present in minimum amount but by the concentration and relative proportions of the constituents in the nutritive medium.

The law of minimum, E. A. Mitscherlich, T. Pfeiffer, and O. Fröhlich (*Landw. Vers. Stat., 77* (*1912*), *No. 5–6, pp. 413–439, figs. 4*).—This is a series of three controversial articles on this subject. See above.

Experiments on ammonia and nitrate formation in soils, J. G. Lipman, P. E. Brown, and I. L. Owen (*New Jersey Stas. Rpt. 1910, pp. 89–124*).—In continuation of previous investigations (E. S. R., 25, p. 423) experiments were made to test further the accuracy of the method used and "to accumulate data on the decomposition of protein compounds in the soil." The experiments here reported dealt with the effect of mechanical composition of the soil, moisture conditions, lime, and various physical and chemical factors on the formation of ammonia in soils. The results obtained in a series of experiments uniformly indicated a high degree of accuracy for the method.

Varying the proportion of sand in the soil had little effect on the formation of ammonia from dried blood, but affected to a marked degree ammonia accumulation, the latter declining as the proportion of sand increased. In pot experiments it was found that addition of sand to soil increased the availability of nitrogen as measured by the nitrogen content of the crop.

"The influence of the increasing amounts of moisture in the soil is apparent, on the one hand, in the increasing yields of dry matter and, on the other, in the decreasing proportion of nitrogen in the latter. The average yield of dry matter gradually rose from 13 gm. to 20.75 gm., but when the proportion of water in the soil mixture was increased from 13 to 15 per cent the yield of dry matter was somewhat decreased. The proportion of nitrogen in the dry matter was highest when the soil mixture contained only 5 per cent of moisture. It was least when the soil mixture contained 15 per cent of moisture. Similarly, the yields of total nitrogen increased from 266.86 to 292.47 mg. when the moisture content in the soil rose from 7 to 9 per cent. Further additions of moisture were followed by corresponding increases, the maximum yield being attained in the soil mixtures containing 13 per cent of water. After that there was a small reduction in the yield of nitrogen."

"The decomposition of organic matter in the soil was favored or retarded by additions of magnesian and nonmagnesian lime according to the character of the organic matter." In experiments with a commercial carbonate of lime containing 2 per cent of boron the latter proved injurious to higher plants and to decay bacteria in the soil.

Wide variations were found in the ammonia formation in soils from different sources.

The addition of monocalcic and dicalcic phosphates to soil greatly increased ammonia formation. Tricalcic phosphate was without effect. "It seems, there-

fore, that the monocalcic and dicalcic phosphate were equally effective in stimulating the activities of the decay bacteria."

It was found "that with a proper supply of lime peat may become a very satisfactory medium for the development of ammonifying bacteria."

The influence of an addition of sugar on the productivity of soils, T. PFEIFFER and E. BLANCK (*Mitt. Landw. Inst. Breslau, 6 (1912), No. 4, pp. 601–612, fig. 1*).—The authors briefly review the work on this subject by A. Koch, Lemmermann et al., and Schneidewind et al. (E. S. R., 20, p. 17; 24, p. 327; 26, p. 319), and report a continuation of studies (E. S. R., 24, p. 319) of the effect of sugar with and without phosphoric acid on the nitrogen supply of different soil plats, as measured by yield of oats and turnips, using 1 kg. of sugar and 100 gm. of Thomas meal per square meter.

The results showed a slightly injurious effect of the sugar on the yield of the oat crop. The after effects of the sugar on the turnips were apparently slightly beneficial. It is believed, therefore, that the importance of the fertilizing effect of sugar or organic substances has been overrated. Further studies with sugar in combination with potash and phosphatic fertilizers are being made.

On the action of an addition of alumina gel to the soil on the assimilation of phosphoric acid by the plants, T. PFEIFFER and E. BLANCK (*Mitt. Landw. Inst. Breslau, 6 (1912), No. 4, pp. 613–617*).—This is a continuation of previous work (E. S. R., 25, p. 121), and reports studies of the effect of alumina on the assimilation of phosphoric acid by yellow lupines, using 390 gm. of aluminum hydroxid, containing 2.1 per cent Al_2O_3, per 18 kg. of sand in pots fertilized with potassium phosphate.

The results, in general, confirmed those of the previous experiments and indicated that the phosphoric acid did not go into absorptive but into chemical combination.

Brief reference is also made to a study of the lime intolerance of lupines. It was found that the iron content was lower for plants grown on a soil rich in calcium carbonate. The potash content of the plants was not reduced by addition of lime to the soil.

The effect of heating and antiseptic treatment on the solubility of fertilizing ingredients in soils, H. I. JENSEN (*Jour. and Proc. Roy. Soc. N. S. Wales, 45 (1911), pt. 2, pp. 169–175*).—Previous investigations bearing on this subject by Russell and Hutchinson (E. S. R., 22, p. 121), Pickering (E. S. R., 24, p. 420), Fraps (E. S. R., 26, p. 726), and Greig-Smith (E. S. R., 25, p. 214) are briefly referred to, and studies of the solubility in strong hydrochloric acid, 1 per cent citric acid, and fifth-normal nitric acid of the fertilizing constituents in 6 soils untreated and (presumably) sterilized by heat are reported.

The results obtained indicate that the treatment (?) made no appreciable difference in the solubility of the mineral fertilizing ingredients in acids and fail to support Greig-Smith's theory of waterproofing the soil particles by agricere. "The evidence is therefore decidedly in favor of the view taken by Russell and Hutchison, that the increased fertility is due to the destruction of the protozoa and nitric acid-producing bacteria and a quick revival of the ammonia-forming bacterial flora."

Influence of the micro-organisms carried to the soil by night soil on the fertilizing effect of the same, G. MASONI (*Staz. Sper. Agr. Ital., 45 (1912), No. 3, pp. 191–223; abs. in Chem. Zentbl., 1912, I, No. 20, p. 1635*).—In pot tests with unmanured soil, that receiving untreated night soil, and that receiving night soil sterilized by heat, sulphuric acid (1 per cent), and sodium sulphate (equivalent to 1 per cent sulphuric acid), the yields were as a rule greater

with sterilized than with untreated night soil on both normal and sterilized soil.

Report of Leteensuo Moor Experiment Station, 1912, E. F. SIMOLA (*Finska Mosskulturför. Årsbok, 16 (1912), No. 1, pp. 92–116, figs. 9*).—A descripiton is given of the station and its equipment, and brief mention is made of the fertilizer trials and other experiments in progress.

Report of the South Oesterbotten Moor Experiment Station, 1912, A. E. RAUTAKOSKI (*Finska Mosskulturför. Årsbok, 16 (1912), No. 1, pp. 117–147, figs. 10*).—A report similar to that of the Leteensuo Moor Experiment Station referred to above.

The nitrate of soda industry of Chile, B. D. OSSA (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 2 (1912), Sect. 11, pp. 187–204, figs. 10*).—This article contains substantially the same information given in a previous article which has already been noted (E. S. R., 24, p. 526).

The author concludes that the Chilean nitrate deposits are capable of furnishing all of the nitrogen required by the world for a century. The technique of the industry is being developed and improved so that the price of nitrogen in nitrate of soda can be still further reduced.

The use of nitrate of soda in commercial fertilizers, C. S. CATHCART (*New Jersey Stas. Rpt. 1910, pp. 41–48*).—The essential features of this article have been noted from another source (E. S. R., 25, p. 120).

The availability of nitrogenous materials as measured by ammonification, J. G. LIPMAN, P. E. BROWN, and I. L. OWEN (*New Jersey Stas. Rpt. 1910, pp. 127–182*).—The availability of nitrogen in dried blood, tankage, ground fish, corn meal, rice, wheat, and rye flours, cotton-seed meal, linseed meal, cowpea meal, and soy-bean meal was measured by vegetation experiments and determined by ammonia formation under different conditions by the following method:

"A large quantity of air-dry, silt loam was sifted and thoroughly mixed so as to furnish a uniform medium for bacterial growth. One hundred gm. quantities of this soil were placed in tumblers, the nitrogenous material was added and carefully mixed with the soil, and the latter was then moistened with a quantity of water or fresh soil infusion, sufficient to establish optimum moisture conditions. The tumblers were covered with Petri dish covers and kept in the incubator at 27° C. for a definite period. Subsequently the different soil portions were transferred to copper flasks, about 200 cc. of water and magnesia were added, and the ammonia was distilled off and titrated against standard hydrochloric acid."

The availability of the nitrogen of the vegetable substances was also determined by their rate of nitrification. In general the results of the nitrification experiments were in agreement with those of the ammonification experiments. "Both methods distinguished between available and unavailable nitrogen compounds in so far as the micro-organisms as well as the higher plants are concerned. They possess, therefore, a direct value for both experimental and control work."

In experiments with combinations of peat and dried blood it was found that "the nitrogen compounds in the peat were so inert as to be scarcely affected in their decomposition by the presence of readily assimilable nitrogen compounds. On the other hand, the latter were unfavorably affected by the peat, for they furnished less nitrogen to the plants when the peat was mixed with them."

The method was found to be applicable to the determination of the availability of nitrogen in mixed substances and complete fertilizers.

Experiments with new nitrogenous fertilizers, 1908–1911, S. RHODIN (*K. Landtbr. Akad. Handl. och Tidskr., 51 (1912), No. 5, pp. 362–382*).—These experiments were a continuation of an investigation by the author commenced in 1903 (E. S. R., 19, p. 220). The effects of fertilization with Norwegian nitrate, sodium nitrate, ammonium sulphate, and cyanamid in connection with other fertilizers were compared on small grains, grass land, potatoes, and mangels.

It was found, as the average for all trials conducted, that the fertilizing effect of cyanamid measured by the increase in the value of the crops raised was from 68 to 70 per cent of that of sodium nitrate and similar to ammonium sulphate, that of Norwegian nitrate being 96 per cent. The experiments, in general, point to the value of cyanamid for the Swedish farmer. While many questions relating to its effects and best methods of application still have to be studied, the results obtained suggest that this fertilizer may prove of great economic value to Sweden as it will tend to make the farmer independent of imported nitrogenous fertilizers.

Destruction of wild mustard by means of lime nitrogen, H. LIPSCHÜTZ (*Deut. Landw. Presse, 39 (1912), No. 68, p. 784, figs. 3*).—To oats, which had been seeded on March 27 and which contained a large admixture of wild mustard, lime nitrogen was applied about the end of April at the rate of about 160 lbs. per acre in the early morning when the dew was on. This application produced some temporary injury to the oats, which was soon overcome, but almost completely destroyed the wild mustard.

Seaweed, potash, and iodin: A criticism, H. KNUDSEN (*Jour. Indus. and Engin. Chem., 4 (1912), No. 8, pp. 623, 624*).—This is a criticism of certain conclusions by Cameron (E. S. R., 27, p. 22) regarding the value of Pacific coast seaweed as a source of potash. It is maintained that "a potash industry on the basis of seaweed will first and last depend on the content of iodin in the marine plants," and that "as yet we possess very little of value and very little authentic information to solve the question: 'Is it possible to build up a lucrative industry on the abundant growth of seaweed at the Pacific coast?'"

The extraction of potash and alumina from feldspar, H. W. FOOTE and S. R. SCHOLES (*Jour. Indus. and Engin. Chem., 4 (1912), No. 5, p. 377; Chem. News, 106 (1912), No. 2753, p. 106*).—Experiments are reported which show that almost complete decomposition of feldspar can be secured by heating it to a temperature well above 100° C. under pressure with hydrofluoric acid, which seems to act in this case as a catalytic agent.

The production of available potash from the natural silicates, A. S. CUSHMAN and G. W. COGGESHALL (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 5 (1912), Sect. IIIc, pp. 33–49; Jour. Indus. and Engin. Chem., 4 (1912), No. 11, pp. 821–827*).—The various processes which have been proposed for this purpose are reviewed, particular attention being given to a process devised by the authors in which lime and salt or calcium chlorid are used as the reducing agents in a new rotary kiln.

This process "depends upon a previous treatment before furnacing, consisting of a method of aggregating or clumping the mix so that chemical contact of the reacting substances is brought about during the subsequent processing. The qualitative and quantitative results obtained on a number of experimental trials on a mill scale of operation are presented and discussed. It is shown that it is possible to economically manufacture a potash fertilizer containing free lime from feldspar and for a sufficiently low cost to make an industry based upon the method, worthy of consideration."

Pot experiments with different potash minerals, D. N. PRIANISHNIKOV (*Landw. Vers. Stas., 77 (1912), No. 5–6, pp. 399–411, pls. 5; abs. in Jour. Soc.*

Chem. Indus., 31 (1912), No. 20, p. 1000).—In continuation of previous experiments (E. S. R., 26, p. 425) the author made comparative tests on a variety of crops of nepheline, muscovite, biotite, leucite, apophyllite, phillipsite, sanidine, microcline, eläolith, and mica schist.

The results show in general that while some of the alumino-silicates are tolerably good sources of potash, others are worthless for this purpose. The feldspar group is a poor source of potash for plants. The minerals tested appeared to stand in the following order as regards availability of potash: Nepheline, mica, biotite, phillipsite, muscovite, eläolith, leucite, apophyllite, sanidine, orthoclase, microcline. This was practically the order indicated by the solubility of the potash of the minerals in neutral salts (ammonium and barium chlorids).

To what extent can the potash of fine-ground feldspar be utilized by plants on moor soils? H. von Feilitzen (*Ernähr. Pflanze, 8 (1912), No. 19, pp. 225–232, figs. 6*).—The results of the experiments here reported, which extended over a series of years, indicated as a rule very little effect from the potash of feldspar as compared with that of potash salts.

Comparative tests of phonolite, 40 per cent potassium salts, and kainit, M. Öhme (*Deut. Landw. Presse, 39 (1912), No. 64, pp. 740, 741*).—Plat experiments on moor meadows during 1910 and 1911 indicated no beneficial results from applications of phonolite, whereas the 40 per cent potassium salts and kainit gave excellent returns.

Thomas phosphate meal, D. J. Hissink (*Cultura, 24 (1912), No. 288, pp. 315–317*).—The requirements of the fertilizer law, as regards the composition, solubility, and physical constitution of Thomas meal as sold on the market in the Netherlands, are stated and briefly explained.

The agricultural value of electric slag, M. de Molinari and O. Ligot (*Ann. Gembloux, 22 (1912), No. 10, pp. 567–572, figs. 2; abs. in Engrais, 27 (1912), No. 41, pp. 1138, 1139*).—A brief account is given of pot experiments with oats on sand and soil to determine the relative fertilizing value of ordinary Thomas slag and slag made by a new electric process. The Thomas slag used contained 21.81 per cent of phosphoric acid soluble in mineral acids and 20.94 per cent soluble in 2 per cent citric acid. The two electric slags used contained, respectively, 5.12 and 6.76 per cent of phosphoric acid soluble in mineral acids and 1.56 and 1.38 per cent soluble in 2 per cent citric acid.

The results showed that on the basis of total phosphoric acid the electric slag gave results inferior to those obtained with Thomas slag. On the basis of phosphoric acid soluble in 2 per cent citric acid the results were about the same.

The assimilation of phosphatic fertilizers in the course of a rotation, A. Müntz and H. Gaudechon (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 4, pp. 257–260; abs. in Rev. Sci. [Paris], 50 (1912), II, No. 5, p. 156; Rev. Gén. Agron., n. ser., 7 (1912), No. 8, pp. 289–292; Chem. Zentbl., 1912, II, No. 15, p. 1307*).—The general conclusion reached from these investigations is that it is not advisable to apply large amounts of readily assimilable phosphatic fertilizers, with the expectation that the effect of such fertilizers will be extended over several years. On the contrary, the amount of such fertilizers should be in proportion to the needs of the crops during each season.

The assimilation of phosphoric acid by plants, A. Müntz and H. Gaudechon (*Ann. Sci. Agron., 4. ser., 1 (1912), II, No. 3, pp. 200–216; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 16, p. 787*).—The rate of assimilation of phosphoric acid by maize, wheat, barley, rape, turnips, mustard, beans, peas, and lupines was determined in pot experiments with monocalcium phosphate (superphosphate), dicalcium phosphate (precipitated phosphate), and tricalcium phosphate.

The results show that assimilable phosphates become inactive in the soil the second or third year after application. Different species of plants vary in their capacity to utilize the phosphoric acid naturally present in the soil and therefore vary in the response that they make to applications of phosphatic fertilizers. The superiority shown the first year by superphosphate on account of its finer division and better distribution becomes very slight the second year and soon disappears, so that the three forms of chemically prepared phosphates used in these experiments showed about equal fertilizing values. See also the article noted above.

The effect of cow dung on the availability of rock phosphate, B. L. Hartwell and F. R. Pember (*Rhode Island Sta. Bul. 151, pp. 165–174, pl. 1*).—"This bulletin contains the results of a pot experiment in which is ascertained the effect of finely ground rock phosphate, or floats, and cow feces or dung, used both singly and combined, on the growth of Japanese millet (*Panicum crus-galli*) and a succeeding crop of oats.

"Previous to drying, grinding, and mixing with the soil, the fresh dung was stored for about 9 months, not only by itself, but also in an intimate mixture with floats." Portions were stored in a shallow pan, allowing free access of air. Other portions were packed in a bottle until the latter was completely filled, and stoppered so that only a small amount of air was present.

The soil used in the experiments had been limed and was deficient in phosphoric acid, but was supplied with optimum amounts of nitrogen and potash.

"The increase caused by the floats alone added to that caused by the dung alone was about equal to that obtained when both were applied together; and it made practically no difference whether the dung and floats were first brought together when they were added to the soil at the time of planting, or had been kept in a moist mixture during the previous 9 months."

The results therefore indicate that practically no increase in available phosphoric acid resulted "from mixing fresh cow dung and floats together for a number of months before applying them to the land."

The action of calcium carbonate in the fertilizing of oats with monocalcium and dicalcium phosphate, W. Simmermacher (*Landw. Vers. Stat., 77 (1912), No. 5–6, pp. 441–471, fig. 1*).—Pot experiments and chemical studies are reported which led to the conclusion that calcium carbonate does not reduce the fertilizing effect of monocalcium phosphate although it reduces the assimilation of phosphoric acid by the plant. In case of dicalcium phosphate, however, calcium carbonate strongly depressed both the yield and assimilation of phosphoric acid. The bearing of the results on the law of minimum as set forth by Mitscherlich (E. S. R., 25, p. 825) is discussed.

The mechanism and fertilizing action of sulphur, E. Boullanger and Dugardin (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 4, pp. 327–329; abs. in Rev. Sci. [Paris], 50 (1912), II, No. 5, pp. 156, 157; Rev. Vit., 38 (1912), No. 976, pp. 250–252; Chem. Zentbl., 1912, II, No. 16, pp. 1392, 1393*).—The favorable action of flowers of sulphur is attributed to its effect on the bacteria which break down the nitrogenous matter of the soil to ammonia, and also on the nitrifying organisms. In the presence of sulphur the plant is able to obtain a large amount of directly assimilable ammonium salts. Since the ammonia is formed exclusively from the nitrogenous matter of the soil, it is necessary to add organic nitrogenous fertilizers to the soil to counterbalance the rapid removal of nitrogen by plants under such conditions.

Action of manganese oxid (MnO_2) on organic nitrogenous compounds with reference to use of the oxid as feritlizer, G. Leoncini and C. Pieri (*Staz. Sper. Agr. Ital., 45 (1912), No. 8, pp. 224–244; abs. in Chem. Zentbl., 1912, I, No. 20, pp. 1635, 1636*).—It was found in these experiments that ammonium compounds

were not oxidized by manganese dioxid. It oxidized amids to nitric acid both in neutral and alkaline solutions at boiling temperature, but not at a temperature of 30° C. Amido acids and acid amids were not affected under these conditions. Uric acid and its derivatives xanthin and hypoxanthin were not oxidized. Only a trace of ammonia was observed. The oxid at ordinary temperatures under the conditions of this experiment did not convert organic nitrogen into nitric nitrogen.

Indigenous manures of South India and their application, W. H. HARRISON (*Dept. Agr. Madras Bul. 65, 1912, pp. 11*).—Among the manures whose composition and use are discussed in this article sunn hemp; indigo; various water weeds; oil cakes; ash of cane trash, cotton stalks, and paddy husks; indigo and rice wastes; fish fertilizers; and saltpeter; besides various animal and mineral fertilizers.

Comparative trials of hand peat-litter machines (*Finska Mosskulturför. Årsbok, 16 (1912), No. 1, pp. 72–85, figs. 8*).—Descriptions and trials of 6 peat-litter machines are given.

Fertilizer statistics, D. ZOLLA (*Rev. Gén. Sci., 23 (1912), No. 18, pp. 707–709*).—Statistics are given of the production of nitrate of soda in Chile from 1830 to 1911; the consumption of nitrate in Europe and Egypt from 1900 to 1911, and in the United States from 1885 to 1911; the production of sulphate of ammonia in France from 1900 to 1911; the consumption of potash per unit area in different countries during 1911; the consumption of phosphates in France during 1900 to 1909; and the production of Algerian and Tunisian phosphates during 1899 to 1911.

Fertilizers, R. E. ROSE and L. HEIMBURGER (*Fla. Quart. Bul. Agr. Dept., 22 (1912), No. 4, pp. 157–167, 171–179*).—An account is given of the fertilizer inspection during 1912, including analyses of fertilizers examined, with notes on laws and regulations and valuation of fertilizers.

Fertilizer analyses, H. B. MCDONNELL ET AL. (*Md. Agr. Col. Quart., 1912, No. 57, pp. 40*).—This bulletin gives tables showing analyses and valuations of fertilizers inspected from February to July, 1912, inclusive, and the text of the new fertilizer law, which will take effect February 1, 1913.

Inspection of commercial fertilizers, season 1911 and 1912 (*Bul. [Miss. Dept. Agr. and Com.] 7 (1912), No. 11, pp. 1, 2*).—This is a report of analyses and valuations of fertilizers examined during October, 1912.

List of fertilizer manufacturers and importers (*Penn. Dept. Agr. Bul. 220, 1912, pp. 39*).—This list gives not only names and addresses of the manufacturers and importers, but names of the "brands of their fertilizers for which license to sell in Pennsylvania during 1912 was taken out prior to February 23, 1912." The text of the State fertilizer law is also given.

The lime inspection law of Maryland (*Md. Agr. Col. Quart., 1912, No. 56, pp. 3, 8*).—The text of this law, which went into effect June 1, 1912, is given.

AGRICULTURAL BOTANY.

Studies on fungi for beginners.—II, Microscopic fungi, G. LINDAU (*Kryptogamenflora für Anfänger. II, Mikroskopische Pilze. Berlin, 1912, pp. VII+(24)+276, figs. 558*).—This gives directions for the microscopical study of the various groups of fungi, followed by synoptical keys and descriptions of genera and species of fungi belonging to the groups Schizomycetes to Basidiomycetes.

Bacteria, yeasts, and molds in the home, H. W. CONN (*Boston, New York, Chicago, and London, 1912, rev. ed., pp. VI+295, figs. 83*).—This is a second edition of the author's popular work, which is designed for use in connection with courses in home economics and by those engaged in household manage-

ment. The general nature of molds, yeasts, and bacteria, and the action and use of beneficial forms are described. Chapters are given on the preservation of food, use of preservatives, canning, etc., as well as on disease bacteria, disinfection, etc. Directions for laboratory experiments to be carried on in connection with courses are also given.

A laboratory guide in soil bacteriology, J. G. LIPMAN and P. E. BROWN (*1911, pp. IV+87, chart 1*).—This little book consists of 55 exercises on soil bacteriology, and is designed by the authors to follow courses in general bacteriology and technique. Chapters are given on the preparation of media, methods of determination, and a descriptive chart for the recording of cultural and morphological characteristics of organisms.

Fungus flora of the soil, C. N. JENSEN (*New York Cornell Sta. Bul. 315, pp. 415–501, figs. 35*).—This gives the results of a study of the fungus flora of the soil, made as a partial fulfillment of the requirements for the degree of doctor of philosophy in Cornell University. After a historical sketch of the subject the author describes methods of taking soil samples and isolating and cultivating the organisms. The major portion of the bulletin is taken up with taxonomic descriptions of the different forms.

The fungus flora of the soil was found to consist of obligate saprophytes and facultative parasites, the former being by far the more abundant. According to the author a fungus should not be considered as belonging to the soil flora unless it has been directly isolated or has been shown under control experiments to live in the soil. In this connection he demonstrated that *Phoma betæ*, one of the causes of root rot of sugar beets, winters on the seed balls and not in the soil, while *Pythium debaryanum* and *Aphanomyces lævis*, other organisms which attack the sugar beet, winter as saprophytes in the soil and not on the seed balls.

The presumable facultative parasites and the obligate saprophytes determined number 132 species and varieties, many of which are recognized as a cause of injury to economic plants.

A study was made of the effect of sulphur on the fungus flora of the soil, but 3 months after its application the soil yielded the same species of fungi as did samples which had received no application.

Bacteria and other fungi in relation to the soil, D. RIVAS (*Contrib. Bot. Lab. Univ. Penn., 3 (1911), No. 3, pp. 243–274, fig. 1*).—The author investigated the numbers and activities of about 28 kinds of bacteria, 2 of cocci and 10 of molds found in soils at 12 stations, and reports the following results and conclusions:

The bacterial contents of the soil were found to vary according to season, being least from November to February and increasing thereafter to a climax in September or October. These soils are found to be very rich in bacteria producing diastatic, inverting, and proteolytic ferments which are especially adapted for digesting carbohydrates and proteids and which, by changing them into glucose and peptones, respectively, render this raw organic matter into assimilable substances. There is thought to be good reason to assume that this already elaborated food material is, through the agency of bacteria, thus made ready for absorption by the root system and for the nutrition of the plant. It is held, therefore, that not alone are water and salts in solution taken up by the root system of the plant but also already elaborated food, such as glucose, and further that such food, in addition to supplying energy and nourishment to the plant, may become a constituent of the protoplasm and may form organized structures, waste products, and reserve materials, this whole process thus resembling in essentials the process of assimilation in animals. Photosynthesis or auto-assimilation by the plant is not thought to explain all

the facts of plant nutrition and in all probability the heterotrophic nutrition suggested by the author's experiments is to some extent effective.

Biological and toxicological studies upon Penicillium puberulum, C. L. Alsberg and O. F. Black (*Proc. Soc. Expt. Biol. and Med., 9 (1911), No. 1, p. 6; abs. in Bot. Centbl., 119 (1912), No. 21, p. 525*).—This fungus, when grown in pure culture upon Raulin's solution, produces a new organic acid termed penicillic acid and thought to belong to the general class called lichen acids. It is stated to be moderately toxic, antiseptic in its action, and a protoplasmic poison. Since lichens are symbiotic forms, composed of fungi and algæ, the finding of this type of substances in the pure culture of a fungus makes it seem probable that in lichens, the lichen acids are the products of the fungus metabolism, and not of that of the algæ.

Some conditions influencing nitrogen fixation by aerobic organisms, W. B. Bottomley (*Proc. Roy. Soc. [London], Ser. B, 85 (1912), No. B 581, pp. 466–468*).—A study has been made of Azotobacter and Pseudomonas separately and in combination to determine a suitable form of sugar for the growth of these nitrogen-fixing organisms.

Under usual conditions mannite is found most efficient for the growth of Azotobacter and maltose for Pseudomonas. The author's investigations, however, show that dextrin is about as efficient as maltose for Pseudomonas and as mannite for Azotobacter, while for a mixed culture of the two organisms it is much more efficient than a mixture of maltose and mannite. For both of these organisms the author recommends a simple and effective nutrient medium obtained by adding to distilled water 1 per cent dextrin, 0.2 per cent dipotassium phosphate, 0.02 per cent magnesium sulphate, and 0.4 per cent basic slag.

The influence of temperature on the movement of zoospores of Chlamydomonas, P. Desroche (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 19, pp. 1244–1247, fig. 1; Compt. Rend. Soc. Biol. [Paris], 72 (1912), Nos. 17, pp. 748–750; 18, pp. 793–795, fig. 1*).—Continuing previous studies on Chlamydomonas (E. S. R., 26, p. 431), the author found that the range of temperature within which movement of the zoospores is possible extends from the freezing point on the one hand to about 40° on the other, provided the containing water be very slowly warmed. Nearly all, however, became inactive between 30 and 32°. This fact and the facts of individual differences of endurance at given temperatures, of behavior on slower or more rapid warming, and of recovery on cooling make it difficult to fix a maximum limit of temperature for the activity of Chlamydomonas.

If the water containing the zoospores be very slowly warmed to 39° and there maintained, in about 15 minutes a marked degeneration of the cilia is observable which results in their complete disappearance in about 1 hour. The author remarks that the degeneration of cilia in this case is quite comparable with that observed in the case of Pythium and Saprolegnia, very different organisms from the one here studied.

Studies in seeds and fruits, H. B. Guppy (*London, 1912, pp. XII+528, figs. 6*).—This book is the result of a study begun on the rest period of seeds and includes observations on some of the factors which are concerned in the rest period and germination of seeds, the relation of seeds to fruits, etc. Among the factors discussed are permeability, hygroscopicity, rôle of shrinking and swelling of seeds, homologies of fruits, dehiscence of fruits, relation of number of seed to weight and size of the fruit, abortion of ovules, seed coloration, and rest period of seeds.

The influence of organic acids and glucose on the respiration of seeds during their swelling, Mlle. G. Promsy (*Rev. Gén. Bot., 24 (1912), No. 283, pp. 313–318*).—In a previous paper (E. S. R., 25, p. 222) the author showed the

effect of citric acid absorbed by the seeds of tomato, pepper, maize, etc. In the present paper an account is given of investigations with beans and peanuts to determine the effect of citric acid and glucose solutions on the respiration of the seed.

It was found that the presence of these substances in a liquid medium where germinating seeds have begun to swell modifies the respiratory quotient, sometimes increasing and other times diminishing it, according to the variety of the seed and to the substance used. When the substance was acid there was always an increase, but when glucose was added there was an increase with some seeds, such as the bean, and a diminution with others, as was the case with the peanut.

Tannin in the seed coats of barley, A. REICHARD (*Ztschr. Chem. u. Indus. Kolloide, 10 (1912), No. 5, pp. 214–219; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 596, II, pp. 592, 593*).—In a previous publication Brown (E. S. R., 21, p. 126) showed that a membrane in the testa of the barley grain exerts a selective action on dissolved substances, inasmuch as only certain of them can pass through it into the seed. The present author has carried on a series of investigations and has found that there is a kind of tannin in the seed covering of barley and that there is an undoubted parallelism between the power of a substance to dissolve this material and its ability to penetrate the membrane.

The investigations were made by a variety of methods, which included the direct action of different substances on sections of the barley grain with subsequent examination of the membrane for tannin, and also adding various substances to ordinary tannin in a test tube and observing the effects. There appears to be some evidence that the tannin in barley is associated with a proteid, and the action of different substances on a compound of protein and tannin was investigated.

The author ascribes the results obtained to a solvent action on the tannin, thus permitting diffusion, or in some cases to a coagulating effect of the reagents on the tannin complex, which prevents diffusion.

Pentosans and methylpentosans in seeds of Glycine hispida and Phaseolus vulgaris during germination, K. MIYAKE (*Jour. Col. Agr. Tohoku Imp. Univ., 4 (1912), No. 8, pp. 327–335*).—From a study of germinating bean seeds the author concludes that pentosans and methylpentosans are not ordinarily used as reserve or nutrient material in germination, being utilized rather to form skeletal structures, but that in case of exhaustion of the more readily available materials these carbohydrates are made to supply the usual offices of such substances, methylpentosans in the larger quantity of the two.

The artificial nourishment of seedlings, W. ZALESKI and N. TUTORSKI (*Biochem. Ztschr., 43 (1912), No. 1–2, pp. 7–9*).—The authors experimented with the axial parts of newly sprouted peas, sterilized and kept in darkness for 20 days in Knop's solution with addition of carbohydrates or in Knop's solution with a small amount of calcium sulphate to which was added either a nitrate, ammonium phosphate, asparagin, or crushed cotyledons of peas.

In carbohydrates these stems showed remarkable increase in size and dry weight, saccharose taking the most and galactose the least part in building new material. Nitrates, ammonia, and asparagin all gave considerable increase in nitrogenous materials, but their utilization is claimed to be indirect, the nitrates being first reduced and the nitrogen built into ammonia, later forming amino acids. Asparagin is thought to act in some small part directly in the formation of new nitrogen compounds. Ammonia is not thought to be directly elaborated into nitrogen products.

Investigations on the nourishment of seedlings with amino acids are still in progress.

Effect of asparagin on absorption and growth in wheat, J. J. SKINNER and J. H. BEATTIE (*Bul. Torrey Bot. Club, 39 (1912), No. 9, pp. 429–437, pl. 1*).—During the progress of studies of the organic matter in soils, experiments have been carried on with a number of organic compounds to determine their effect on plant growth. In the present paper an account is given of experiments on the effect of asparagin on the growth of wheat seedlings in culture solutions containing nutrient salts.

When the plants had grown for several days it was noticed that the asparagin cultures were better developed, the seedlings having broader leaves and longer and better developed roots. The effect of asparagin was more marked in the cultures containing potash and phosphate than in those which contain potash, phosphate, and nitrate.

This led to studies under control conditions which indicated that asparagin can be utilized for plant synthesis. The effect of the asparagin decreased with increasing quantities of nitrate, so far as additional effect on growth is concerned, but it was found to have a conserving effect on the nitrate left in the solution during the time the plants were growing.

Studies on the carbohydrates and nitrogen-containing bodies in grape leaves, N. T. DELEANO (*Hoppe-Seyler's Ztschr. Physiol. Chem., 80 (1912), No. 1, pp. 79–94*).—In continuation of previous work (E. S. R., 25, p. 523), the author reports that by analysis of dried grape leaves gathered in September he was able to demonstrate the presence therein of dextrose, levulose, inosit, glutamin, and cholin, but not of sucrose, amino acids, alloxuric bases, histidin, arginin, or betain. A bibliography is appended.

Phosphoric acid and nitrogen in alcoholic extracts of leaves, J. SEISSL (*Ztschr. Landw. Versuchsw. Österr., 14 (1911), No. 6, pp. 886–893; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 593, II. p. 288*).—The author's analyses of leaves of horse chestnut, maple, oak, mock orange, and knotweed made monthly during the growing season showed a fairly constant decrease in total phosphoric acid and nitrogen, this diminution being usually more marked in the older leaves. The ratio of phosphorus to nitrogen also usually showed a decrease, notably in case of horse chestnut and especially just before leaf fall.

The influence of phosphates on the post-mortem respiration of plants, W. ZALESKI and ELISABETH MARX (*Biochem. Ztsch., 43 (1912), No. 1–2, pp. 1–6*).—Continuing previous studies (E. S. R., 26, p. 729), the authors experimented with grain and pea seeds, pulverized and kept for varying periods in solutions of acid, alkaline, and neutral reaction.

It was found that, in general, acids decreased and alkalis increased the evolution of carbon dioxid. The latter effect, occurring (as in case of edestin) in absence of hydroxyl, is pointed to as an obstacle to acceptance of the views of S. Kostytschew and A. Scheloumow (E. S. R., 26, p. 627).

It is claimed that some part is played by the phosphates contained in the seeds tested. It is suggested also that the effect of alkaline phosphates is in part due to the protection given by the alkalinity against the depressing effect of acid-reacting substances (as casein) on the evolution of carbon dioxid, thus favoring a greater net result as regards this product.

Contribution to the study of circulation. Studies on the sweet potato (Ipomœa batatas), B. H. A. GROTH (*New Jersey Stas. Rpt. 1910, pp. 283–286, pls. 2, fig. 1*).—In continuation of a previous report (E. S. R., 25, p. 431), an account is given of the circulation in the sweet potato as influenced by the rooting of the plants at the nodes. In addition to this work, an investigation with the object of tracing the movement of reserve starch in the circulation of a many-rooted sweet potato plant was begun. It was found that the storage starch in a sweet potato plant with the normal direction of the water current is

intercepted in its course by the first roots basal to the leaf from where it starts, and does not go beyond it.

The bearing of the results of these experiments on the cultivation of the sweet potato is quite evident, as they show that any portion of a many-rooted sweet potato plant may draw water from the roots most favorably situated, which are those in the main hill, so that whenever a drought occurs the rooted branches will draw water from the main hill. Every rooted joint of any branch intercepts all the starch brought from all the leaves beyond it and allows none to pass to the main hill. In a dry time a rooted branch may feed upon the main root, but in the best growing time it does not help the crop of the main plant in the least.

The stomatograph, W. L. Balls (*Nature [London], 87 (1911), No. 2180, p. 180; Proc. Roy. Soc. [London], Ser. B, 85 (1912), No. B 576, pp. 33–44, figs. 5*).—The appliance here described and discussed is said to be a self-recording modification of Darwin's porometer (E. S. R., 27, p. 222), indicating changes in stomatal aperture by recording variations in the quantity of air forced through a leaf. It is claimed to be extremely easy to use, independent of weather changes, and especially adapted to outdoor conditions such as are met with in agricultural and ecological studies. Records obtained with Egyptian cotton indicated that this instrument may be of great utility in the study of purely economic matters connected with irrigation, and it is thought also that it may replace aspirators for many kinds of scientific research. The results of some studies on the behavior of stomata are given, and the significance of these stomatal changes as related to carbon dioxid assimilation in the growth of the plant is also discussed.

Photosynthesis and stomatal aperture, W. L. Balls (*Nature [London], 89 (1912), No. 2231, p. 555*).—In the paper noted above the author, having found that Egyptian field cotton plants showed stomatal opening practically only from 6 a. m. to 12 m., reaching a maximum about 9 a. m., expressed the expectation that (1) this afternoon closure might be found to provide a limiting factor on photosynthesis by restricting the inward diffusion of carbon dioxid; and (2) since the theoretical possibilities of carbon dioxid assimilation have probably never yet been approached and since the stomata are wide open for an hour or two in the morning, record values in carbon dioxid assimilation might be obtained at the times of such maximum aperture.

The present brief report states that both these expectations have been fulfilled. It was found that assimilation was very greatly reduced, if not inhibited entirely, during the afternoon by the closing of the stomata. Some other data obtained are reported in this connection.

Reversible changes in permeability produced by electrolytes, W. J. V. Osterhout (*Science, n. ser., 36 (1912), No. 924, pp. 350–352*).—Different opinions being held regarding the property of permeability of the cell, the author has investigated it to determine whether there are reversible changes which involve no injury and which may form a normal part of the activity of the cell. If such changes occur it is believed that they may control the course of metabolism.

Disks were cut from living tissue of the fronds of common kelp and their electrical conductivity in various solutions determined. It appeared that the permeability may be greatly decreased and then restored to the normal several times on five successive days without any trace of injury. Experiments with dead tissues, killed by heat or formalin, showed that the results were due entirely to the living cells.

It is concluded that it is possible to cause rapid and large changes in permeability by means of electrolytes, that these changes may consist in

either an increase or a decrease in permeability, and that within wide limits they may be completely reversible and entirely devoid of injurious effects.

The oxidases of Cytisus adami, F. KEEBLE and E. F. ARMSTRONG (*Proc. Roy. Soc. [London], Ser. B, 85 (1912), No. B 581, pp. 460–465*).—A study has been made of *C. adami*, which bears yellow, buff, and purple flowers, to determine from its oxidases the origin of this so-called graft hybrid. This plant, which is supposed to have been derived from *C. purpureus* budded on *C. laburnum*, has been considered a periclinal chimera, that is, a dual organism composed externally of one species and internally of another.

The author's investigations on the oxidases confirm Baur's hypothesis, the oxidases of the flowers produced from the different portions of the plant showing different reactions. There was also found evidence to support their own claim that oxidases may migrate from cell to cell. It is believed that certain tissues of the vascular system may be regarded as secretors of oxidases which have among other functions the formation of flower pigments.

The primary color factors of Lychnis and color inhibitors of Papaver rhœas, G. H. SHULL (*Bot. Gaz., 54 (1912), No. 2, pp. 120–135*).—The main substance of this report has already been noted (E. S. R., 26, p. 827), but later studies have resulted in discoveries necessitating the withdrawal of *L. dioica* for the present as an example of dominant white, apparently without affecting, however, the general considerations as originally presented. A bibliography is appended.

Cell number in the fruit of the prairie berry, B. H. A. GROTH (*New Jersey Stas. Rpt. 1910, pp. 287–291, pls. 2*).—The results of a study of heredity of fluctuation as shown in the prairie berry or garden huckleberry, a cultivated variety of *Solanum nigrum*, are given. Considerable variation in the number of cells in the fruit had been previously noted, and the fruits of several plants grown from the seed of a single fruit were examined and the variation observed. While the averages appear consistent and instructive, the author holds that the variation in individual plants was so great that they can not be considered conclusive.

Observations concerning evolution, derived from ecological studies in New Zealand, L. COCKAYNE (*Trans. and Proc. New Zeal. Inst., 44 (1911), pp. 1–50, pls. 8, figs. 3*).—The results of an ecological study of the plants of New Zealand are given and the bearing of some of the facts upon evolution of species is discussed. The main object of the paper is to supply material of a botanical nature to students of evolution. A bibliography of the subject is appended.

FIELD CROPS.

[Field husbandry experiments], J. E. HOWITT and C. A. ZAVITZ (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 37 (1911), pp. 46, 47, 51–54, 175–248, figs. 11*).—The work of 1910 has been previously noted (E. S. R., 25, p. 527).

A list of the weeds attracting most attention during the year is followed by descriptions of the Russian thistle (*Salsola kali* var. *tenuifolia*), crab or finger grass (*Digitaria sanguinalis*), water hemlock or spotted cowbane (*Cicuta maculata*), and wood horsetail (*Equisetum sylvaticum*), together with brief notes on their eradication. Spraying white cockle with a 30 per cent solution of iron sulphate prevented seed production and spraying ragweed in oats with a 20 per cent solution gave profitable results. Samples of red and alsike clover and alfalfa seed were tested for purity and the results are reported.

Weather conditions in 1911 are reviewed and a table is given showing the precipitation for April to September, inclusive, in each of the past 12 years.

The average yields per acre in a comparison of barley, emmer, oats, hull-less barley, spring wheat, field peas, and spring rye, mentioned in the decreasing order of yield, ranged from 2,672 lbs. to 1,709 lbs. of grain for the past 11 years. Results with 35 varieties of cereals and potatoes grown continuously on the same farm from 17 to 23 years show that fully 80 per cent of the varieties gave considerably larger yields during the latter as compared with the earlier part of the period. In this connection, suitable crop rotations are discussed and attention is called to the importance of growing the most profitable varieties.

Experiments on the influence of seed selection with different crops in progress from 6 to 9 years are described and a table is presented showing that in every instance the large plump seed gave a greater yield of grain per acre than small, shrunken, or broken seed. The crops entering into this experiment were spring and winter wheat, oats, barley, and peas, and exactly the same number of seeds were used in the different plats. Plant selection as a factor in crop improvement is dwelt upon, and the O. A. C. No. 21 barley and the O. A. C. No. 72 oats, originated at the college, are described. The O. A. C. No. 21 barley is a selection from Mandscheuri barley, which has long been the leading variety in Ontario but which is being supplanted at the present time by the new strain, which 4 years' cooperative experiments in Ontario have indicated to be the better of the two in yield of grain per acre, freedom from rust, and both length and strength of straw. The O. A. C. No. 72 oats, a selection from the Siberian variety, was distributed during the past year and the results secured have shown it to be a very promising variety when compared with other sorts such as Lincoln, Regenerated Abundance, and Siberian. It is pointed out that the distribution of new varieties is greatly facilitated by the Ontario Agricultural and Experimental Union, which numbered in 1911 4,490 experimenters.

When 9 different proportions of oats and barley were used in combination the mixture of 4 pks. or 34 lbs. of oats and of 4 pks. or 48 lbs. of barley per acre gave the highest results in a test of 6 years, as well as in a second test of 5 years. This mixture surpassed in yield of grain per acre any one of 16 other combinations. Different varieties of farm crops grown in combination with barley for 5 years, the rate of seeding being 1 bu. of each per acre, showed that in every single instance the resulting crop was over 50 per cent barley. The lowest percentage of barley was secured where Guy Mayle hull-less variety was used with Siberian oats, and the highest percentage where Mandscheuri barley was mixed with common flax. The influence of the Mandscheuri barley was more pronounced than any of the two-rowed barleys used in combination with oats. In studying the percentages of grain produced by different mixtures, it was observed that six-rowed barley and oats have a strong tendency to reproduce themselves even when sown in combination with a larger number of other leading varieties and classes of farm crops.

Work in combating loose smut in oats and stinking smut in wheat was continued and a number of different treatments were compared. Early Ripe oats proved practically immune to the attacks of smut spores, while Black Tartar and Siberian were quite badly infested in 1911. The results of all the experiments showed that the greatest yields of both winter wheat and oats per acre were secured from the grain immersed in a solution of 42 gal. of water and 1 pt. of formalin for 20 minutes. This treatment was the most effective in completely preventing smut in a 5-year test.

The average yield of winter barley grown at the college for 15 years was 54.8 bu. per acre, the average weight being 47.8 lbs. per measured bushel.

Within the past 18 years winter barley has been completely killed out on three occasions, while during some of the other winters it was partially killed.

In comparing the average results of varieties of oats, the percentage of hull as affecting the quality of the grain was taken into account. It is pointed out that Early Dawson oats, having an average weight of 37.55 lbs. per measured bushel in a 6-year test is not as valuable as the Daubeney variety which had a weight of only 34.29 lbs. per measured bushel, but which had nearly 10 per cent less hull. Observations made on the stooling of oats for 3 years indicated a variation in the average number of stools from 7 in Storm King and Tartar King to 18 in Joanette, Burt, and Regenerated Abundance. American Banner and Siberian occupied an intermediate position. It is stated that in general heavy stooling varieties appear to adapt themselves better to conditions than varieties which stool very little.

Experiments with potatoes led to the conclusion that good-sized tubers of good shape should be selected for seed and that the sets should vary in size from 1 to 2 oz. and have from 2 to 4 eyes each. The yields from level and from hilled cultivation have shown practically no difference in experiments over a series of 10 years. In wet seasons, hilled cultivation and in dry seasons level cultivation gave the best results. In experiments with Bordeaux mixture in combating potato blight, the best results were obtained from spraying 3 times on top and underneath the vines. This treatment gave larger yields per acre than when the potatoes were sprayed from 5 to 6 times on top of the vines.

During the past 6 years, Japanese Panicle millet, Japanese Barnyard grass, and Hungarian grass were sown at intervals of about 2 weeks beginning May 15 and ending August 1. The highest average yield for the 3 varieties, 8.28 tons of green crop per acre, was obtained from the seeding made June 1.

The average results for the past 11 years with a number of miscellaneous leguminous crops grown for green fodder show that hairy vetch ranked first in green fodder production per acre with a yield of 7.1 tons, being followed by Grass peas, Early Yellow soy beans, and Wonderful cowpeas with 6.8, 6.5, and 4.9 tons per acre respectively. In numerous experiments with red clover, it was found that land, after growing this crop, was more easily plowed and was in a more friable condition than land on which timothy, meadow fescue, or orchard grass had been grown. Tests made with alfalfa resulted in an average yield of 20.41 tons of green crop and 4.9 tons of hay per acre for a period of 14 years. Canadian Variegated alfalfa has proven very hardy and is considered worthy of special attention in the Province of Ontario.

Good results were secured from a pasture mixture consisting of 51 lbs. of oats, 30 lbs. of Early Amber sugar cane and 7 lbs. of red clover per acre. This mixture was used for a temporary pasture of 1 year's duration. For permanent pasture 4 lbs. of orchard grass, 4 lbs. of meadow fescue, 3 lbs. of tall oat grass, 2 lbs. of meadow foxtail, 2 lbs. of timothy, 2 lbs. of alfalfa, 2 lbs. of alsike clover, and 2 lbs. of white or Dutch clover per acre are recommended in the light of experience for more than 20 years' work in testing different varieties of grasses and clovers for this purpose.

The higher yields obtained in variety tests are indicated in the following table:

Summary of the more notable yields secured in variety tests.

Crop and variety.	Number of varieties tested.	Period of test.	Average yield per acre.	Crop and variety.	Number of varieties tested.	Period of test.	Average yield per acre.
		Yrs.	*Bu.*			*Yrs.*	*Bu.*
Barley (Mandscheuri)	7	5	76.60	Broom corn (Early Japanese)	3	9	22.40
Barley (Imported No. 5591 Iowa)	6	5	64.39	Corn (Early California Flint)	12	5	59.70
Barley (Guy Mayle)	6	5	45.94	Potatoes (Davies Warrior)	57	5	239.40
Oats (Daubeney)	30	6	79.89				*Tons.*
Wheat (Dawson Golden Chaff)	14	16	54.10	Mangels (Giant Eckendorf)	12	5	30.68
Wheat (Carleton)	15	5	32.44	Sugar beets (Rennie Jumbo)	12	5	24.80
Wheat (Roumania)	7	5	33.35	Swedes (Keepwell)	14	5	20.02
Wheat (Wild Goose)	3	19	37.50	Carrots (Steele Improved Short White)	6	6	28.00
			Lbs.				
Emmer (common)	3	10	2,872	Fodder corn (Eureka)	47	5	24.68
Spelt (Alstroum)	3	10	2,115				
			Bu.	Sorghum (Orange sugar cane)	9	13	18.26
Rye (Petkus)	3	7	30.00	Millet (Japanese Panicle)	9	5	4.10
Buckwheat (Rye)	5	7	31.00	Cabbage (World Beater)	4	5	30.60
Field Peas (Early Britain)	8	12	36.93	Timothy (Pasture)	4	4	1.63
Flax (Manitoba)	4	7	17.55				
Millet (Siberian)	7	8	51.80				
Sunflowers (Mammoth Russian)	3	13	76.61				

[Forage and cover crops], F. C. MINKLER (*New Jersey Stas. Rpt. 1910, pp. 51–57*).—Good results are reported from the use of oat and pea forage run through the ensilage cutter in a slightly wilted condition and placed in the silo. In this way silage in prime condition was provided for dairy cows during the entire summer season and the milk flow was maintained during the period of hot weather and the lack of green forage.

A total of 98 tons, or an average of 5.9 tons per acre, was secured from 16½ acres of alfalfa at the station. A new seeding of 10 acres yielded 30.425 tons of cured hay mowed May 30. The manner of making this seeding on August 24 of the preceding year is described in detail.

The yield of 9 tons of forage is reported from an acre of ground seeded in September, 1909, with 50 lbs. of rye and 20 lbs. of vetch drilled in rows 8 in. apart. The yield of hay from 9 acres of oats and peas was approximately 3 tons per acre, and fertilizer tests continued in this connection confirmed previous results, showing that basic slag supplies phosphoric acid more economically than ground bone and acid phosphate. The use of different cover crop mixtures, the principal one consisting of 40 lbs. of wheat and 25 lbs. of winter vetch per acre, seeded just prior to the last cultivation of corn during the latter part of July, is reported.

The seed-corn situation, C. P. HARTLEY (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 95, pp. 13, figs. 2*).—The general seed-corn situation in the spring of 1912 is reviewed and means of preventing such situations are suggested.

Results secured in 2 series of 5-year tests made by the Office of Corn Investigations and 28 experiment stations for the purpose of observing the value of home-grown seed showed that a variety stood high or low in rank according to its adaptation or lack of adaptation to the locality in which the test was made. In one particular instance, a variety native of Sabina, Ohio, was taken 50 miles north and grown for 5 years at Sunbury in that State. Equivalent lots of Sabina-grown seed and Sunbury-grown seed were then tested at both points.

At Sabina, the Sabina-grown seed produced better by 47 per cent, while at Sunbury, the Sunbury-grown seed produced better by 11 per cent.

Germination tests made by the Seed Laboratory of this Department of 1,708 samples of seed corn from 17 of the principal corn-growing States and intended for use in the spring of 1912 gave an average germination of 81 per cent, the lowest germination for the different States ranging from 0 to 30 per cent. The seed corn sent from 7 of these States contained samples with 0 per cent of germination. Tests made by this laboratory of 73 samples of seed corn from 8 different States gathered and dried early by the Office of Corn Investigations gave an average germination of 98.1 per cent.

The care of seed corn is discussed and the results of experiments to demonstrate the possible profits from the good preservation of seed corn are reported. It is stated that 17 tests of seed corn dried and stored in a seed-corn dry house and of seed corn stored in the crib gave figures showing an average increase in yield of 5 bu. per acre in favor of the special storage. A more extensive field test along the same line gave similar results.

Inheritance in corn, H. K. Hayes (*Connecticut State Sta. Rpt. 1911, pt. 6, pp. 407–425, pls. 8*).—This article summarizes in a popular manner the results of corn breeding work carried on by the station for the last 6 years and previously noted (E. S. R., 17, p. 857; 25, pp. 736, 737). The way of detecting and culling out the accidental hybrid seed is described and the manner in which desirable qualities are inherited is pointed out. In discussing crosses showing dominance, the appearance of the crosses, the production of the seed of pure varieties, and the inheritance of characters is considered. The behavior of crosses not showing dominance is also discussed and notes are given on abnormalities, including dwarf forms, divided ears, and irregularity in the rows of seeds.

Results of cotton experiments in 1911, O. F. Cook (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 96, pp. 21*).—This bulletin reports the progress in experiments with cotton and summarizes briefly the principal conclusions, especially those affecting general problems of breeding and crop production.

Attention is called to the utilization of improved varieties of American Upland cotton bred by this Department for the improvement of the cotton industry, and to the results secured in Texas and other southwestern States with acclimatized new types of Upland cotton introduced from weevil-infested regions of Mexico and Central America. One of the new varieties from Mexico, known as Durango, was found to be the most promising Upland long-staple cotton for irrigated districts in that region. The advantages to be gained from cooperative organization on a community basis for the production and marketing of a single superior variety of cotton are pointed out.

Improved methods of selection in which the value of distinctive characters by which the plants may be recognized in the field is taken into account, and better methods of distributing select varieties to avoid waste and to encourage the production of superior fiber on a community basis were devised and are described in detail. Cultural methods are suggested for avoiding malformations of young seedlings which often delay the development of the plants and reduce the yield. Several methods of utilizing superior first-generation hybrids between Egyptian and Upland varieties of cotton, including the propagation of such hybrids from cuttings, are reported as being under test.

Experiments have shown the possibility of controlling the development of vegetative branches by thinning the plants gradually and restricting the supply of water in the early stages of growth. This control, it is pointed out, facilitates cultivation and picking and favors greater production.

It was observed that the Egyptian type of cotton was less susceptible to the shedding of the buds and young bolls than the Upland cotton and that the differences in habits of growth and methods of picking render the Egyptian cotton superior to the Upland type as a family crop. It is believed that the successful production of Egyptian cotton in Arizona and southern California does not justify expectations of similar results in Texas where the conditions are essentially different and where the Durango variety is preferable for the irrigated districts.

Cotton crop of the United States, 1790–1911, G. K. HOLMES (*U. S. Dept. Agr., Bur. Statis. Circ. 32, pp. 9*).—The production, value, domestic exports, net imports, and consumption of cotton in the United States for the years 1790 to 1911, inclusive, are reported in tabular form. Prior to 1867 no figures for the average yield per acre, and prior to 1869 no data for the value of lint, are reported.

Hop crop of the United States, 1790–1911, G. K. HOLMES (*U. S. Dept. Agr., Bur. Statis. Circ. 35, pp. 8*).—In so far as the data are available the production, value, domestic exports, imports, and consumption of hops for the United States from 1790 to 1911, inclusive, are given in tables.

Potato culture, H. J. EUSTACE (*Michigan Sta. Circ. 15, pp. 4, fig. 1*).—Popular notes on the culture of potatoes are presented.

Potato spraying experiments, 1902–1911, F. C. STEWART, G. T. FRENCH, and F. A. SIRRINE (*New York State Sta. Bul. 349. pp. 99–139*).—This bulletin gives a detailed account of potato spraying experiments conducted in 1911 and summarizes the results of similar experiments made during the 9 years preceding and already noted (E. S. R., 25, p. 442).

The main experiments were conducted at Geneva and Riverhead, Long Island, and at each place one series of plats received annually 3 sprayings of Bordeaux mixture and another series 5 to 7 sprayings. At Geneva, 3 sprayings resulted in an average increase of 69 bu. per acre for the 10 years as compared with 97.5 bu. per acre for from 5 to 7 sprayings. In the Long Island experiments, 3 sprayings gave a 10-year average increase of 25 bu. per acre and from 5 to 7 sprayings an increase of 45.7 bu.

The results of experiments made by farmers during 9 consecutive years to determine the actual profit in spraying potatoes under farm conditions showed an average increase of 36.1 bu. per acre in favor of spraying. The total expense of spraying in these experiments was $4.74 per acre and the net profit $14.43 per acre. In 205 experiments carried out entirely by farmers themselves over a period of 7 years, the average increase in yield was 54.3 bu. per acre.

Spraying thoroughly when the plants are from 6 to 8 in. high and repeating the operation at intervals of from 10 to 14 days throughout the season is recommended.

Ten years of potato spraying, F. H. HALL (*New York State Sta. Bul. 349, popular ed., pp. 11*).—This is a popular edition of the above.

A preliminary report on rice growing in the Sacramento Valley, C. E. CHAMBLISS (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 97, pp. 10, pls. 4*).—Tests with 300 varieties of rice were begun in 1909 in the Sacramento Valley on a black adobe soil of a close compact structure. The seed of each variety was planted with a drill to a depth of 1½ to 2 in. at the rate of 80 lbs. per acre on plats consisting of 4 rows a rod each in length and 7 in. apart. In 1910, a selection of 13 varieties from the 300 was tested on ⅕-acre plats. The yields for the different varieties ranged from 23.1 to 154 bu. per acre and the growing season from 142 to 193 days. In another test in 1910 in which the yield was estimated upon the actual yield from plats ½-acre in size the Wataribune (G. I.

No. 1561) and the Shinriki (G. I. No. 1642) varieties yielded 113.7 and 137.2 bu. per acre respectively.

It was found that in the Sacramento Valley the rices under test required a longer time to mature and produced smaller plants than when grown on the plains of the Gulf coast, but that they exhibited a greater capacity for tillering with resultant larger yields. The Honduras and Shinriki varieties (G. I. Nos. 1643 and 1642), the leading commercial rices of the United States, exceeded in this test the maximum yields produced on experimental plats in Louisiana and Texas. Of the two, the Shinriki is considered better adapted to the Sacramento Valley. It is pointed out that the Wataribune, the Oiran, and the Shinriki varieties produced good crops but that earlier maturing varieties of good quality, though producing less per acre, may be more remunerative for this locality. Suggestions as to the methods of culture are given and the statement is made that the results of the 2 years' work indicate the possibility of rice culture in the Sacramento Valley.

Rice crop of the United States, 1712–1911, G. K. Holmes (*U. S. Dept. Agr., Bur. Statis. Circ. 34, pp. 11*).—Tables are given showing in so far as data were obtainable the production, value, domestic exports, imports, and consumption of rice for the United States for the years 1712–1911, inclusive.

Tobacco crop of the United States, 1612–1911, G. K. Holmes (*U. S. Dept. Agr., Bur. Statis. Circ. 33, pp. 12*).—Data regarding the production, value, domestic exports, net imports, and consumption of tobacco in the United States from 1612–1911, inclusive, are given in tables.

Tobacco report, July 1, 1912, J. P. Killebrew (*U. S. Dept. Agr., Bur. Statis. Circ. 38, pp. 7*).—The acreage of tobacco in the United States July 1, 1912, by States and districts is reported in tables and the condition of the crop at this date is described. The 1912 area of cigar-leaf tobacco is given at 172,400 acres against a final estimate of 177,400 acres in 1911, and the acreage of the chewing, smoking, snuff, and export type is reported at 1,012,300 acres as compared with a final estimate of 819,500 acres in 1911.

Growing winter wheat in Iowa, L. C. Burnett (*Iowa Sta. Bul. 133, pp. 259–273, figs. 11*).—This bulletin reviews the history of winter wheat in Iowa, presents statistics showing the relative production of spring and winter wheat for the State, and reports the results of experiments carried on by the station. Notes are given on cultural methods and on crop rotations including winter wheat.

The average yields of 4 winter wheat and 4 spring wheat varieties at the station for the 5 years 1906–1910, inclusive, were 33.8 and 24.2 bu. per acre, respectively. Experiments with 10 varieties of winter wheat carried on from 1906–1910 showed that the Russian types Malakoff, Imported Turkestan, Minnesota No. 529, and Turkey Red gave uniformly good results and produced on an average for this 5-year period 36.9, 36, 35.5, and 34.3 bu. per acre, respectively.

A 4-year comparison of drilling and broadcasting winter wheat resulted in an average yield of 29.1 bu. per acre on the drilled and of 24.9 bu. on the broadcasted plats. It is stated that the best results at the station were secured from placing the seed in the top of the moist earth below the dust mulch, or about 1½ to 2 in. below the surface. The yields so far obtained have favored sowing early in September. In 1912, the station obtained a good stand and also broke the crust by drilling clover in the standing wheat about April 20.

On the vitality of farm seeds, W. Carruthers (*Jour. Roy. Agr. Soc. England, 72 (1911), pp. 168–183, figs. 5*).—The author describes briefly a machine similar to, or identical with, the "Preparator" previously described by Hume and

Garver (E. S. R., 27, p. 235), and states that "a similar machine was made in England, at my suggestion, with the result that clover seeds may be purchased with a guarantied germination of 98 or 100 per cent. This gain was clearly established by these experiments. . . ."

A brief account is given of a transfer of live wheat embryos to dead seed kernels of various colors. The results "clearly show that living embryos transferred to the food store of dead seeds utilize it freely, and that the store of food retains all its properties for many years after the seed is dead."

Samples of 43 kinds of farm seeds were secured from the harvest of 1895 and stored during the succeeding 16 years in paper bags in close cabinet drawers. Germination tests indicated that the germinating power of barley and wheat was but little affected during the first 5 years, but decreased with increasing rapidity from that time until the tenth year, when no live seeds remained. Oats showed no serious loss of vitality until after the ninth year. Five years later white oats showed no living seeds, but black oats germinated for 15 years. The retention of vitality by oats is attributed to the adherence of the glumes.

In case of grasses the "death of all the samples occurred between the eighth and thirteenth years." Three main types appeared, one represented by timothy and tall oat grass, in which vitality was well maintained for 4 years and dropped rapidly thereafter; a second, of which hard fescue and sheep fescue were most characteristic, in which the germination tests showed a rapid drop to a point below 10 per cent, at which they remained practically stationary for a year or so before vitality disappearing entirely; the third crop is typified by Italian rye grass and less perfectly by meadow fescue, and shows a fairly steady loss of vitality from first to last.

The 3 true clovers (red, white, and alsike) showed a slight loss of vitality during the first 3 or 4 years, a rapid loss of vitality for about 4 years more, and finally the gradual loss of the last 10 per cent during the next 3 or 4 years. Trefoil lost vitality very steadily from first to last. Sainfoin lost almost as steadily. Alfalfa decreased rapidly at first then changed little between the fifth and ninth years after which it decreased quite regularly, being practically dead at the end of the fourteenth year.

Of the cruciferous seeds tested, 5 sorts were entirely dead at the end of the thirteenth year, and 4, kale, white turnip, and purple and green top swedes showed very rapid decreases in vitality during the tenth year. The decrease in case of rape and the yellow turnip was decidedly slower but began somewhat earlier. Rape was entirely dead during the eleventh season. Carrots and yarrow seed lost their vitality at a rather uniform rate and entirely during the tenth and eleventh seasons, respectively. Tables and curves show in detail the results of the germination tests from which these conclusions are drawn, and tables state the results of other tests dealing with the rapidity of germination of seed of the same group of plants.

HORTICULTURE.

[Report on investigations in plant heredity and plant shading], B. D. HALSTED ET AL. (*New Jersey Stas. Rpt. 1910, pp. 221–272, 277–282, 292–295, pls. 29, figs. 2*).—In continuation of previous investigations (E. S. R., 25, p. 444) inheritance in plants was studied in the following truck crops: Beans, corn, eggplants, okra, peas, peppers, squashes, and tomatoes. In order to lay a foundation for the determination of rules of inheritance that may be of general application special emphasis has been laid upon the behavior of tomato crosses in their first generation. The types selected have been bred reciprocally with each other and the plants extensively studied from seedling to full maturity.

Results of this study to date are here briefly summarized. A full report of the work has been published in a series of bulletins (see page 742).

Owing to a prolonged drought poor results were secured from the corn breeding work in many instances. The behavior of a few of the more promising crosses is briefly discussed. A further study was made during the year relative to flintiness in sweet corn. The test appeared to point to two kinds of flintiness or starchiness, one of which, it is suggested, may illustrate a type of seed character that is transferred by the pollen; the other form is classed as an ear or plant character. When the latter form of flintiness is present it does not appear to be readily transmitted through cross pollination to adjacent pure sweet grains.

A number of eggplant crosses and hybrids are discussed with reference to their inherited characters, and attention is also given to the nature of the eggplant inflorescence and changes during the growth of the fruit. A similar but more detailed study of the life history and structure of the leading types of peppers is reported, together with tabular data on a number of second generation crosses.

In the work of breeding and selecting for choice sorts of tomatoes several promising crosses selected for length of the fruit have been tested. A few of these crosses are briefly discussed. A brief study similar to that for the eggplant was also made of the development of the okra fruit during the growing season. Tests of the pepino or melon pear (*Solanum muricatum*) indicate that it is of no economic importance as compared with the eggplant, its near relative.

Experiments in limitation of fruit bearing were conducted with tomatoes, eggplants, bush beans, and bush squashes. For the plants studied the results indicate that excessive fruit thinning unaccompanied by vegetative pruning leads to a rank vegetative growth and only a slight increase in the size of the few remaining fruits. There appears to be a certain limit for every plant as to the actual size of its fruits, regardless of the quantity produced.

Observations were made of the effect of a midsummer drought upon a number of ligneous plants. A well-marked zone of retardation in the growth of both leaves and stems corresponding to the drought period was observed. At the resumption of favorable moisture conditions, the leaves and stems again assumed normal size.

Tests of a number of ornamentals secured in previous breeding work are briefly noted. They include hybrid forms of dianthus, foxglove, Nicotiana, pansy, and hibiscus and a pelargonium cross. A comparative test of the Russian sunflower (*Helianthus annuus*) grown on poor soil and on rich soil resulted in an increased number of ray flowers for the heads growing on rich soil. A diagram is given showing the great variation in number of ray flowers in a large number of heads of the Blackeyed Susan (*Rudbeckia hirta*). Observations of leaf variation in the common ragweed (*Ambrosia artemisiæfolia*), giant ragweed (*A. trifida*), green milkweed (*Acerates viridiflora*), and the Drooping Forsythia (*Forsythia suspensa*) are discussed and illustrated.

A preliminary experiment in growing plants under shade was conducted in the greenhouse during the summer of 1910 to serve as a guide for the selection of material and suitable conditions for a larger field experiment. Of the plants observed, it appears thus far that beans, Bryophyllum, radishes, Kochia, and corn furnish good examples of different effects of shade; but all except beans and Bryophyllum suffer too severely in the shade.

Inheritance studies with beans were continued along lines previously noted and are reported separately (pp. 277–281), by E. J. Owen.

Horticultural information (*Ohio Sta. Circ. 124, pp. 143-147*).—This circular comprises a guide to the accessible sources of information relative to various phases of horticultural practice. Attention is called to the publications of the state and government institutions and a list is given of books, bulletins, and periodicals dealing with horticultural subjects.

Vegetable growing in Alabama, P. F. WILLIAMS and H. M. CONOLLY (*Alabama Col. Sta. Circ. 14, pt. 2, pp. 59-83, figs. 2*).—Part 1 of this circular (E. S. R., 26, p. 740) discussed in detail commercial vegetable growing in Alabama. The present part contains popular directions for growing the more important vegetables in the home garden. Notes are given relative to storage, home canning, and some common insects and diseases of the garden.

A planting table adapted to Alabama conditions is appended.

The F_1 heredity of size, shape, and number in tomato fruits, B. H. A. GROTH (*New Jersey Stas. Bul. 242, pp. 3–39, pls. 3, figs. 8*).—In continuation of a series of studies previously reported (E. S. R., 25, p. 828) this bulletin describes the inheritance, in the first generation of crosses, of macroscopical and microscopical structures in a number of types of tomatoes. Heredity of size and shape of fruit, number of locules in the fruit, size of the epidermis of fruit cells, and thickness of the radial wall of the epidermis in fruits are shown in a series of charts and discussed at length.

The principal deductions derived from the work are summarized as follows:

"Fruits of tomato types may possess latent factors for size and shape different from those they exhibit. Either the factors for the actual size and shape or the latent factors may be active in a cross to determine the size and shape of the F_1 fruits.

"The size and shape of the F_1 fruits are the geometric means between the size and shape corresponding to those factors of the parents, which were active in crossing.

"Fruits of tomato types may carry a factor for two locules; or a factor for two locules and another for addition cells; or a factor for two locules, another for addition cells, and a third for a broken center.

"When types possessing a factor for addition cells are crossed with two-celled types or with each other, the differences between the number of locules of the cross and those of the two parents separately bear to each other the same ratio as the differences between the surface area of the equatorial section of the F_1 fruit and the respective areas of the two parents separately bear to each other.

"In crosses of types possessing factors for a broken center with other types, the inheritance of cell number in the F_1 fruit is similar, except that another factor for cell number, a function of the respective factor for broken center, becomes active in determining the cell number of the cross.

"In the F_1 fruits of types possessing factors for broken centers with each other, the factor for the lower cell number seems to be dominant. (Five instances only.)

"The F_1 heredity of size, shape, and number in cell structures of the fruit skin is influenced by other unknown factors besides the factors for size, shape, and number apparent in the parents.

"Reciprocal and duplicate crosses usually agree in the inheritance of all characters studied; but they may differ greatly. Even fruits borne by plants raised from the seed of one fruit pollinated by pollen from a single flower may differ radically in characters of size, shape, and number.

"When crossing the rough 'Peaches' with smooth types, partial Xenia may occur."

Orchard irrigation studies in the Rogue River Valley, C. I. Lewis, E. J. Kraus, and R. W. Rees (*Oregon Sta. Bul. 113, pp. 47, figs. 11*).—During the past 5 years the station has been conducting orchard irrigation investigations, especial attention being paid to a determination of the best dates as well as the best amounts and ways of applying the water under the various soil and orchard conditions found in the Rogue River Valley. The work for each season is here discussed in detail.

Irrigation practices in the Rogue River Valley were found to vary according to the soil, the kind of fruit grown, and the age of the trees. Some of the heavier soil types have shown best results under cultivation without the use of water. Soils of medium texture derived a direct benefit from light irrigation. The lighter types of soil under ordinary circumstances show that a considerable amount of irrigation is necessary for the production of commercial fruit on heavily bearing trees. The use of an excessive amount of cold water in the irrigation of pear trees on sticky soils is considered a questionable practice, since it did not increase the size or quality of the fruit and the result on the tree was detrimental rather than beneficial. Bartlett pear trees which are in good vigor and planted on strong soils appear to become more susceptible to disease under irrigation.

Irrigation aided in giving a larger percentage of fruit of marketable size. In some cases the reduction in the number of windfalls amounted to as high as 15 per cent of the crop. There were less culls caused by calyx cracking on the irrigated plats than on the dry checks. Irrigation had a tendency to keep both the wood and foliage more active in the fall, as well as to prevent premature ripening of the fruit. The shape of the fruit was found to be materially changed by irrigation. The apples receiving the best care were more elongated and angular, while those that suffered through lack of moisture had a tendency to become flat. The effect on color was more noticeable on the lighter soils where red apples were grown. The irrigated apples had a brighter, more attractive color while those grown on the checks were duller yet deeper in color. In many cases irrigated trees had more numerous and stronger fruit buds for the succeeding crop. By means of irrigation a much better stand of cover crop can be secured in late summer and early fall. Attention is called to the importance of cultivation and good drainage as adjuncts to irrigation.

The temperature of well water was found to increase in some cases as much as 8½° during the day while flowing in open furrows to the point of distribution. Water used from an irrigation ditch showed in some cases an increase of 15½° over the morning temperature. In both cases where temperatures were read it was found that the soil had decreased in temperature immediately following the irrigation. The decrease was more noticeable in the surface soil. It amounted in some instances to a difference of 3° in temperature.

To assist in determining the benefit or detriment of irrigation with respect to the development of the fruit itself, a study of the effect of irrigation on the chemical composition of the apple is now in progress.

Cover crops for Michigan orchards and vineyards, H. J. Eustace (*Michigan Sta. Circ. 18, pp. 123–134, figs. 10*).—This circular describes the most common systems of orchard soil management, and discusses the value of various plants for cover crop purposes as determined in orchards of various ages and on different soil types and located in various parts of the State.

Of the leguminous crops winter vetch and Mammoth clover appeared to be the most valuable, the latter doing somewhat better than winter vetch upon a clay soil. Spring vetch and Canada peas have also proven of value. Of the nonleguminous crops buckwheat, rye, oats, and barley were found to be adapted

to Michigan conditions. A combination of oats and winter vetch or oats and peas is considered much better than oats used alone.

The pollination question (*Oregon Sta. Circ. 20, pp. 7*).—A discussion of the pollination of apples and pears, in which is set forth some of the practical results obtained in the station's work throughout the State for several years past. A general broad view is also given of the important points to be kept in mind with respect to orchard pollination. A publication dealing exclusively with the research phases of the pollination work will appear in the future.

The circular concludes with a list of commercial varieties of apples and pears most grown at the present time in Oregon and grouped according to the desirability of interplanting to secure best results from pollination.

Top working apple trees, C. P. HALLIGAN (*Michigan Sta. Circ. 14, pp. 92–94, figs. 2*).—A popular circular describing the method of top working apple trees by means of the cleft graft.

Dressings for pruning wounds of trees, A. D. SELBY (*Ohio Sta. Circ. 126, pp. 163–170*).—A popular circular containing suggestions relative to available antiseptic materials, the essential requirements of a wound dressing, and the available materials for wound dressings.

Recent investigations in fig culture and caprification, G. P. RIXFORD (*Pacific Rural Press, 84 (1912), Nos. 2, pp. 28–30; 3, pp. 52–53*).—A popular review of the progress made in recent investigations dealing with the establishment of the Smyrna fig industry in California.

The severe frosts of the past winter proved very disastrous to the mamme crop of caprifigs in which the Blastophaga are harbored during the winter. To offset this difficulty a California fig grower made the important discovery that the mamme figs may be taken from the tree in December before the advent of heavy frosts, stratified in a box of clean, damp sand, and stored over winter in a cellar without injuring the Blastophaga, which were found to come out as usual and enter the profichi, or spring crop of caprifigs. By harboring the insects in this manner it is suggested that it may be possible to extend the Smyrna fig industry all along the Gulf region of the Southern States from Florida to Texas.

New method of extracting olive oil, F. T. BIOLETTI (*Pacific Rural Press, 84 (1912), No. 16, p. 372*).—A new method of extracting olive oil from fresh olive pulp, which has been recently tested in Italy with good results, is here briefly described.

Instead of using a press as in the ordinary methods of extracting olive oil, the extractor consists of 2 concentric cylinders separated by a narrow space. The outer cylinder is of sheet metal and the inner one is a metallic screen. The olive pulp is placed in the inner cylinder and kept in motion by a revolving axle furnished with aluminum pallets. By means of a suction fan attached to the lower half of the outer cylinder a slight difference of pressure is produced between the inside and the outside of the inner cylinder. The oil and water are thus extracted from the pulp. Contrary to the results secured in the ordinary press, the oil comes out more easily than the water and a greater proportion of water remains in the pulp. It is claimed that about 10 per cent more oil is obtained from the new system and that the quality of the oil is uniform and equal to or better than the first run from ordinary presses. The olives can be worked while fresh and the troubles and defects due to drying, molding, and rotting are avoided.

Report on experiments with citrus fruits at the Beeville substation, A. T. POTTS (*Texas Sta. Bul. 148, pp. 5–22, pl. 1, figs. 10*).—This bulletin comprises a brief résumé of the experiments with citrus fruits which have been conducted at the substation during the past few years. The varieties which

have proved most resistant to cold are indicated and attention is called to the most improved methods of cultivation to secure both production of fruit and resistance to cold.

The experiments to date have shown that the only varieties which are sufficiently frost resistant to be used in commercial plantings are the Kumquat and the Satsuma. By selecting favorable sites, planting windbreaks, giving good cultivation, and sowing winter cover crops, the danger from frost injury can be greatly reduced. It is recommended, however, that no extensive planting be made without some well-defined plan for fighting the frost.

Experiments in the use of orchard heaters during the winters of 1911 and 1912 are described. The author concludes in substance that although there is no question as to the value of orchard heaters as an aid in frost protection, since the freezes that occurred in the winters of 1911 and 1912 would tax to the utmost any system of orchard protection, it is yet to be determined whether orchard heaters may be used for a number of years under Texas conditions with a degree of profit to the grower. Shortly before cold weather is expected all varieties of citrus fruits should have clean earth piled above them to a height of 12 to 18 in. In case of a severe freeze all wood thus covered will be saved.

The better oranges, limes, and lemons, E. CHAVEZ (*Estac. Agr. Cent. [Mexico] Bol. 67, 1912, pp. 72, pls. 42*).—This comprises descriptive accounts of the principal species and varieties of citrus.

FORESTRY.

The Michigan woodlot, J. F. BAKER (*Michigan Sta. Circ. 17, pp. 107–122, figs. 6*).—This is a brief popular treatise on woodlot management. It discusses the scope of farm forestry, the present condition of Michigan woodlots, timber estimating, woodlot protection, cutting, reproduction, establishment of new woods, and species and soils. A short note is also given relative to the State cooperative woodlot work.

Forty years' management of woods, D. TAIT (*Quart. Jour. Forestry, 6 (1912), No. 4, pp. 279–298*).—This comprises a report of the management of the woods on the Owston Park estate, near Doncaster, England, for a 40-year period with special reference to the financial returns secured.

The relative yields obtained by the destructive distillation of different forms and species of hardwoods, L. F. HAWLEY and R. C. PALMER (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 6 (1912), Sect. IV, pp. 138–146*).—Tests made to determine the commercial value of different species of hardwoods as raw material for distillation are described. Data obtained in each of the distillations, together with the average yields of alcohol and acid from different parts of the tree, are given for beech, birch, maple, gum, chestnut, and hickory.

Distillation of resinous wood by saturated steam, L. F. HAWLEY and R. C. PALMER (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 13 (1912), Sect. VIa, pp. 151–176, figs. 5*).—This is a report of an investigation of the fundamentals of the steam distillation process. Pitchy longleaf pine was used in the distillation tests. The results are presented in tabular form and discussed. Consideration is given to the effects of the size of chip, pressure of steam, speed of distillation, and end point at which distillation is stopped, on the yield of total oil, the composition of the oil, and the amount of steam required to remove the oil.

Tests to determine the commercial value of wood preservatives. A progress report, II. F. Weiss (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 13 (1912), Sect. VIa, pp. 279–300, figs. 5*).—An account of preliminary experiments conducted to determine the practical value of a number of substances which have been either used or suggested as wood preservatives. The following points were studied in these tests: The important chemical and physical properties of the preservative; the effect of the preservative on the strength of the wood [illegible]ation we[illegible] penetration and diffusion of the preservative through the wood; perma[illegible]t com[illegible] of the preservative after its injection into the wood; the combustibility [illegible] the treated wood; toxic efficiency of the preservative; the corrosive action o[illegible] steel; and the effect of the preservative on paint applied to the wood subsequent to treatment.

Recent investigations in the realm of wood conservation, E. F. Petritsch (*Centbl. Gesam. Forstw., 38 (1912), Nos. 6, pp. 265–282, figs. 8; 7, pp. 321–333, figs. 3; 8–9, pp. 383–392, figs. 2*).—A general review of experimental work in the use of wood preservatives.

DISEASES OF PLANTS.

Smut fungi and smut diseases, V, O. Brefeld (*Untersuch. Gesammtgeb. Mykol., 1912, XV, pp. V+151, pls. 7*).—In continuation of previous studies of the author (E. S. R., 18, p. 449), this volume is largely taken up with a consideration of smut fungi. The pathological effect of the fungus on the host plant; the preservation of the fungi within and without the host plants; a study of some of the fungi related to smuts, [illegible]ch as Geminella, Entorrhiza, and Ustilaginoidea; the present state of knowl[illegible]lge regarding the smut diseases; hemibasidia forms; and fruiting forms of [illegible]mut fungi are discussed. Chapters are also given on the occurrence of chlamydospores and comparisons of their form in the higher and lower fungi.

Two new species of rusts, W. H. Long (*Mycologia, 4 (1912), No. 5, pp. 282–284*).—A description is given of two parasitic fungi, one which is the type of a new genus, *Tricella acuminata* n. sp., occurring on *Coursetia glandulosa*, and the other, *Peridermium inconspicuum* n. sp., which was collected on *Pinus virginiana*.

The present state of knowledge regarding the propagation of rust, J. Beauverie (*Ann. Soc. Bot. Lyon, 36 (1911), pp. 24–60*).—This is a critical review of literature prior to 1911 and a discussion of the present state of information regarding parasitism, specialization of rusts, immunity from their attacks, and the various theories regarding the propagation and wintering of rusts. A bibliography is appended.

Studies on Corticium javanicum, A. [illegible] and the [illegible] cylinder [illegible]. (*Bul. Jard. Bot. Buitenzorg, 2. ser., 1912, No. 4, pp. 50, pls. 9*).—This p[illegible] [illegible] here listed as now known on 141 species contained in 104 genera. Culture methods are here detailed and a bibliography is given. See also a previous note (E. S. R., 25, p. 546).

The æcidia of Puccinia fusca, A. F. Pavolini (*Bul. Soc. Bot. Ital., 1912, No. 4, pp. 90–93*).—This is a very brief discussion of the development of the æcidiospores in the case of this fungus, suggesting a further study thereof and comparative studies of other Uredineæ in this respect.

Fungus diseases, J. E. Howitt (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 37 (1911), pp. 47–51, figs. 3*).—Notes are given on the occurrence of a considerable number of plant diseases, some of which are said to be becoming prevalent and destructive in Ontario. In addition directions are given for treatment to prevent attacks of loose smut of wheat (*Ustilago tritici*), crown rust of oats (*Puccinia coronata*), hollyhock rust (*P. malvacearum*), rose leaf

blotch (*Actinonema rosæ*), blight of ginseng (*Alternaria panax*), and sooty blotch of apples (*Leptothyrium pomi*).

Phytopathologic notes, G. ARNAUD (*Ann. École Nat. Agr. Montpellier, n. ser., 12 (1912), No. 1, pp. 5–22, figs. 9*).—The author gives the results of studies on several parasitic fungi substantially as follows:

Sphæropsis pseudo-diplodia, a very variable fungus occurring on many woody plants, is considered to include properly several forms known by other names as species of Sphæropsis, Macrophoma, Diplodia, etc. *Physalospora cydoniæ* is thought to be the perfect form of *S. pseudo-diplodia*. The latter is a weak parasite, attacking usually plants or parts already injured or weakened from other causes, increasing the injury, and hastening death, or else only forming cankers in case of resistant plants. The fungus is often found in relation with the work of a bark-boring beetle (Scolytus).

Phoma (*Fusicoccum*) *cinerescens*, the pycnidial stage of *Diaporthe cinerescens*, is said to be the only vegetal parasite seriously affecting *Ficus carica*, causing on twigs, branches, and trunk extensive cankers which slowly destroy the tree, the annual loss therefrom being important. The progress of this parasite is found to be closely related to the inroads of a minute beetle, *Hippoborus ficus*.

Glœosporium nervisequum, said to be the pycnidial form of *Gnomonia veneta*, causing anthracnose of the plane tree, produces in spring alterations along the veins of the leaf and in autumn along the borders, causing yellowing of the leaves and drying of the branches affected.

Plant pathology, E. J. BUTLER (*Ann. Rpt. Bd. Sci. Advice India, 1910–11, pp. 112–117*).—Notes are given on several diseases of the palm, soft rot of ginger (ascribed to *Pythium gracile*), a leaf disease of turmeric (said to be due to a species of Taphrina), a parasitic disease of the tea bush and one of tea seed, some forest tree diseases, fruit diseases, etc. A brief bibliography is appended.

Contributions to the study of straw blight of cereals, G. FRON (*Ann. Sci. Agron., 4. ser., 1 (1912), I, No. 1, pp. 3–29, figs. 3; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 4, pp. 1054–1056*).—Black foot or straw blight, which has been attributed to *Ophiobolus graminis* and *Leptosphæria herpotrichoides*, is held by the author, as the result of his studies, to be due to the latter organism. This fungus appears in May or early in June, spreading rapidly and showing as a felt-like mass on the stalks, which turn gray and finally wither. The mycelium penetrates the cells, preferring those near the vascular bundles. The black perithecia appear inside the leaf sheaths about September, and in November and December contain a large number of spores which escape in cold, dry weather and easily infect the young wheat plants. Infection of older plants is rare and difficult. The mycelium lives through the winter and in the next fall produces a still larger number of perithecia.

The incubation period is long. The spores retain their power to germinate while in the perithecia, but on escaping soon germinate or perish as they lose their vitality quickly in light (especially sunlight) and in dry air, these conditions also retarding mycelial growth. The spores were found much more resistant to iron sulphate than to the corresponding copper salt.

The author thinks that the conidia attributed to a supposedly new fungus found in May, 1909, and provisionally named *Cercosporella herpotrichoides*, are the summer fructifications of *L. herpotrichoides*. The fungus requires an alkaline or a neutral medium for its development, growth being checked by very slight acidity.

Means suggested for control of this fungus include (1) late sowing (January or February); (2) selection of resistant varieties; (3) thin sowing, permitting access of light and dry air; and (4), in case of planting in drills, unequal widths between rows (narrow and wide spaces alternating).

Foot rot of grains, R. DE POLO and E. VOGLINO (*Coltivatore, 58 (1912), No. 18, pp. 567–572, figs. 2*).—The authors briefly state the results of their observations on this disease, which is said to have assumed importance in parts of Italy.

It was noted that the plants and varieties which are most forward, luxuriant, and promising in spring suffered more from the disease than did those of slower and more open growth, later maturity, and smaller yield. A series of experiments extending over several years is suggested in order to find a means of avoiding the loss which is said now to be large.

The black foot disease of wheat, L. MANGIN (*Jour. Agr. Prat., n. ser., 24 (1912), No. 32, pp. 174–176, figs. 3*).—Under the above name the author describes a disease of wheat in which the bases of the culms are attacked. It causes a reduction in the mechanical tissues of the plant to such an extent that the wheat lodges irregularly, without reference to winds or rain. Two fungi are held to be responsible for this trouble, *Ophiobolus graminis* and *Leptosphæria herpotrichoides*, the latter species being considered the more important in causing its development.

For the control of this disease the author recommends clearing the soil of the fungus by burning the straw, which is of little value when attacked by the fungus, treating the seed with a solution of copper and dusting with lime, fertilizing the land with superphosphate at the rate of 1,500 kg. per hectare, the use of sulphate of iron on the soil before seeding, late seeding, and a consistent system of rotation of crops.

A fungus affecting pastures in Manning River district, G. MARKS (*Agr. Gaz. N. S. Wales, 23 (1912), No. 8, p. 682*).—A brief account is given of an attack of *Physarum cinereum* on grasses and clovers of all classes except Paspalum. It destroys plants in small circular patches, ranging in diameter from a few inches to a foot or more. As its destruction is desirable it is suggested that the infected areas be covered and burned.

Potato disease, F. BASTY (*Petite Rev. Agr. et Hort., 18 (1912), No. 421, p. 135*).—The author calls attention to the high price of potatoes due to a number of causes, among them attacks of *Phytophthora infestans*, and for its control he recommends spraying with a copper sulphate solution or with Bordeaux mixture. Two treatments are believed to be sufficient in an ordinary year, one to be made before the appearance of any disease, the other to follow after an interval of 2 weeks or more.

The effect of certain chemical substances on the vitality of the buds of potato tubers, and their disinfective action on potato blight (Phytophthora infestans), F. STOWARD (*Proc. Roy. Soc. Victoria, n. ser., 24 (1911), No. 2, pp. 270–292, pls. 4*).—The principal object of this investigation was to ascertain the influence, under definite conditions of time, temperature, and concentration, of certain antiseptic compounds in solution on blight-free or blight-infected tubers, particularly in regard to the annihilation of the buds of the treated tuber, and in case of blight-infected material, of the hibernating mycelium of *P. infestans*. The tubers were subjected to solutions of common salt, sulphuric acid, boric acid, carbolic acid, and formalin.

When the tubers were intact, blight free, and mature the entry of the solute during the earlier stages of immersion was chiefly if not solely by way of the buds. These were destroyed by soaking the potatoes for 10 hours in a 10 per cent solution of sulphuric acid. This was also found to destroy all the mycelium

in blight-infested tubers, entering in this case not only through the buds but through those parts of the skin which had been damaged by the fungus.

The results of the investigation indicated that the storage and cooking qualities of the tubers were not injuriously affected by the treatment.

Investigations on the root disease of sugar cane, J. R. JOHNSTON (*Porto Rico Prog., 3 (1912), No. 10, pp. 11, 15*).—As a result of examinations of canes diseased near the root, the author thinks that there are in Porto Rico various types of root disease, only one of which, *Marasmius sacchari*, has been well worked out. Some other forms found on diseased roots are *Clathrus* sp., *Asterostroma albidocarneum*, and perhaps, *Corticium* sp., some of which may be important factors in the production of this condition.

Report of committee on root gall to the American Association of Nurserymen, E. A. SMITH (*Nat. Nurseryman, 20 (1912), No. 8, pp. 300, 301*).—A preliminary report is given of cooperative experiments that have been established by a committee of the American Association of Nurserymen, the work having been undertaken during 1911. The experiments, some of which are in cooperation with experiment stations, are now in progress in 10 different States, the object being to determine the cause and method of control of the different forms of root gall on nursery stock.

Apple blister canker and methods of treatment, W. O. GLOYER (*Ohio Sta. Circ. 125, pp. 149–161, figs. 7*).—The author describes the blister canker of apples due to the fungus *Nummularia discreta*, which is said to be quite prevalent in southern and eastern portions of Ohio. The fungus is said to be a wound parasite, and is difficult to control when once it has attacked a tree. Except in cases of slight attack the tree ultimately succumbs to the disease.

To prevent infection from the blister canker fungus the author recommends that precautions be taken to prevent the drying of the tissues following pruning or other injury. This may be done by covering the wounds with a suitable dressing, such as asphaltum, grafting wax, etc. Proper orchard sanitation, such as removal and destruction of diseased parts, is also recommended.

Bitter pit in apples, A. J. EWART (*Proc. Roy. Soc. Victoria, n. ser., 24 (1911), No. 2, pp. 367–419*).—The author conducted a series of experiments to test the theory of Miss White (E. S. R., 26, p. 55) that bitter pit of apples is due to local poisoning. In his experiments a large number of inorganic, organic, and gaseous poisons were tested on the pulp of apples under varying conditions.

It was found that the ripe pulp cells of apples are more sensitive to various poisons than any other known organisms, the limit of toxic action in the case of mercuric chlorid being with a concentration of 1 to 10,000,000,000. The cuticle and bloom of sound apples were found remarkably impermeable to poisons, but when these were removed the poison penetrated readily. Young apples were found more easily penetrated by dissolved poisons than old ones, but their pulp cells were more resistant. Hence a young apple may absorb sufficient poison to kill a portion of its tissue when more mature, without any immediate toxic effect being shown.

Substances occurring normally in the soil, it is stated, may exercise a toxic effect on the fruit when presented singly, but in mixtures their individual poisonous action is decreased. The poisonous action of copper sulphate and other soluble metallic substances may be decreased by the addition of substances which decrease the percentage of free ions, and in this way it is possible to modify Bordeaux mixture and arsenate of lead without appreciably affecting their value as insecticides and fungicides. Zinc arsenite was found less poisonous than lead arsenate and is considered equally effective as an insect poison. Among the gases present in the air, ozone, ammonia, and nitric acid were found able to produce surface pitting in apples, but only in amounts and

with lengths of exposure much greater than those presented under ordinary conditions.

In conclusion the author states that he considers it established that bitter pit is, strictly speaking, not a disease but a symptom of local poisoning produced in the sensitive pulp cells of the apple, that more than one poison may produce it, and that the poisons may be derived from more than one source.

A new leaf spot fungus on pear trees in Pavia, L. MONTEMARTINI (*Riv. Patol. Veg., 5 (1912), No. 14, pp. 225, 226*).—A brief report is made on the discovery by the author of a fungus causing a leaf spot disease of pears in Pavia. The fungus is described under the name *Hadrothricum piri* n. sp.

Grape mildew and the time necessary for infection, L. RAVAZ and G. VERGE (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 33 (1912), No. 7, pp. 195, 196; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 4, p. 1058*).—It is claimed to have been shown by these experiments that 1½ hours is sufficient time for infection to occur by fresh conidia of *Plasmopara viticola* in water on the lower side of the leaf.

Treatment of chlorosis of grape, J. VERCIER (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 33 (1912), No. 23, pp. 713, 714*).—This is a very brief account of some tentative experiments in treating chlorosis of the grape with sulphate of iron. The results were encouraging and further trials are promised.

Roncet and arricciamento, E. PANTANELLI (*Coltivatore, 58 (1912), No. 13, pp. 399–405, figs. 6*).—This continues the author's previous discussion of roncet (E. S. R., 25, p. 654; 26, p. 851), now noting more particularly its possible connection with another affection of the grape, occurring sporadically in Italy and known as frizzle disease. Some relations of these two abnormalities to hybridization of certain forms and to root pressure and transpiration are also noted. A later report is promised.

The spread of American gooseberry mildew in Baden, K. MÜLLER (*Ztschr. Pflanzenkrank., 21 (1911), No. 8, pp. 449–454, fig. 1; abs. in Riv. Patol. Veg., 5 (1912), No. 14, pp. 227, 228*).—A discussion is given of the first appearance in 1908 of *Sphærotheca mors-uvæ* and of its later appearances in parts of Baden. It is claimed that all outbreaks originated where stock brought from other sections had been planted and that the spread from wind-borne conidia in summer is of only local importance.

Stem-end rot and gummosis, H. S. FAWCETT (*Proc. Fla. State Hort. Soc., 24 (1911), pp. 41–52, pl. 1*).—A summary account is given of the investigations carried on by the author while at the Florida Station on stem-end rot, due to Phomopsis, and gummosis, caused by *Diplodia natalensis*, previous notes upon them having been given elsewhere (E. S. R., 25, p. 450; 26, p. 449).

Some fruit diseases, J. B. RORER (*Dept. Agr. Trinidad and Tobago Bul., 11 (1912), No. 70, pp. 75, 76*).—Descriptions are given of anthracnose of the mango due to *Glœosporium mangiferæ* and anthracnose of the avocado caused by *Colletotrichum* sp. It is said that both of these diseases can be controlled by spraying with Bordeaux mixture if the work be thoroughly done and started in good season.

Banana diseases are briefly described, the two most prevalent troubles being the Panama and moko diseases. The Panama disease is believed to be due to a species of Fusarium, while the moko disease is apparently of bacterial origin. It is stated that the varieties of banana subject to one disease are apparently quite resistant to the other.

Spraying cacao, J. B. RORER (*West Indian Bul., 12 (1912), No. 3, pp. 275–277; Dept. Agr. Trinidad and Tobago Bul., 11 (1912), No. 70, pp. 34–36*).—In order to ascertain whether cacao diseases, and particularly the canker and black pod rot, due to *Phytophthora faberi*, can be controlled by spraying, the

author conducted a series of experiments on a block of 1,000 trees divided into two equal parts, one of which was sprayed with Bordeaux mixture while the other was left unsprayed.

At harvest all fruits were carefully examined and the results show conclusively that spraying cacao is an efficient method for controlling the diseases. Allowing for labor, materials, etc., a gain of over $20 from 500 trees was reported in a single season.

Cacao canker, E. Essed (*West Indian Bul., 12 (1912), No. 3, pp. 302–308*).—The results of a six months' study of cacao canker in Surinam have led the author to the belief that the disease is not primarily due to Phytophthora, as has been claimed by Rorer (E. S. R., 23, p. 748), but is to be attributed to attacks of *Spicaria colorans*, as previously described by A. E. van Hall de Jonge (E. S. R., 22, p. 547).

A possible inference to be drawn from the studies on cacao canker, A. Fredholm (*West Indian Bul., 12 (1912), No. 3, pp. 308–310; Dept. Agr. Trinidad and Tobago Bul., 11 (1912), No. 70, pp. 46–48*).—The author is disposed to criticize the claim of Rorer (E. S. R., 23, p. 748) that pod rot, canker, and chupon wilt of cacao is solely due to *Phytophthora* sp. He considers canker as a condition and not a specific disease and that several parasitic fungi attacking cacao trees may produce cankerous conditions.

Fungus diseases of cacao, F. W. South (*West Indian Bul., 12 (1912), No. 3, pp. 277–302*).—Popular descriptions are given of the principal diseases of cacao known to occur in the West Indies and contiguous regions. A bibliography of references is given.

Bud rot of the coconut palm, J. B. Rorer (*Dept. Agr. Trinidad and Tobago Bul., 11 (1912), No. 70, pp. 68, 69*).—The disease of the coconut palm attributed by Johnston (E. S. R., 26, p. 649) to *Bacillus coli* is described. This disease appears to be quite prevalent in Trinidad, and sanitary measures have been taken to prevent its spread, about 18,000 trees having been destroyed. Since this work has been done there has been a marked reduction in new cases of infection, and the author claims that this indicates rather conclusively that the disease can be held in check by these measures, provided they are widely enforced.

Rows of spots on the leaves of palmyra palms, W. McRae (*Agr. Jour. India, 7 (1912), No. 3, pp. 272–279, pls. 5*).—The author describes a form of disease in the leaves of palmyra palm that is due to the fungus *Pythium palmivorum*, the cause of the bud rot of this tree.

The parts of this palm most susceptible to attack are the succulent yellow parts of the leaf sheaths. When the fungus begins its attack, well above the level of the growing point, it eats its way inward through the leaf sheaths until it reaches the young expanding leaves The tissues of the leaves are then attacked, the fungus boring holes through them which become quite evident upon the expansion of the leaves.

Cutting out the affected leaves is recommended as probably the most satisfactory method of dealing with this trouble.

A preliminary note on the heredity of fungus diseases of certain plants, L. Blaringhem (*Bul. Soc. Bot. France, 59 (1912), No. 2–3, pp. 217–220*).—A record is given of observations on *Lolium temulentum*, which is often attacked by a fungus; *Althæa rosea*, the seeds of which are commonly infected with *Puccinia malvacearum;* and *Œnothera nanella*, which is claimed to be a dwarf form of *Œ. lamarckiana*, attacked by a Micrococcus. From the frequency of the occurrence of these diseases on their host plants, the author thinks the relation of symbiosis has become an acquired character.

The case of Lolium temulentum and Althæa rosea, S. Buchet (*Bul. Soc. Bot. France, 59 (1912), No. 2–3, pp. 188–191*).—The author discusses the sup-

posed dependence of *L. tomulentum* and *A. rosea* on the symbiotic fungi which commonly infest them. He claims that they may and do exist absolutely independently of their fungus symbionts without changing their character in any degree. He holds that the necessary dependence of the host on the fungus does not exist.

Stem rot of carnations, M. A. BLAKE and A. J. FARLEY (*New Jersey Stas. Rpt. 1910, pp. 78–81*).—Severe losses due to stem rot of carnations have been reported by florists in several parts of the State. It has been found that the disease is especially severe upon plants that are bruised or injured in cultivation or during the process of benching. The stations have carried on experiments to determine means by which the losses can be reduced, and red shale soil has been studied with a view to its adaptability for the growing of carnations. The results of a test of this soil mixed with different proportions of sand and with and without composted manure are described.

The results indicate that the addition of composted manure to soils of the red shale type intended for the forcing of carnations increases the danger of loss by stem rot, also that the addition of considerable sand with the composted manure further increases the danger of loss. The stations have succeeded in growing carnations successfully upon red shale soil without the use of composted manure, and if proper physical conditions of the soil can be secured and chemical fertilizers used, it is believed that there will be little danger of loss from fungus diseases.

Foot rot of carnations, L. FONDARD (*Petite Rev. Agr. et Hort., 18 (1912), Nos. 416, pp. 80, 81; 418, p. 103; 420, p. 128*).—This is a brief synthetic discussion based on investigations conducted mainly by others.

This disease, known also as root disease, branch disease, etc., and found mainly in the coastal region of France, though also occurring in other parts, is ascribed to a fungus, *Fusarium dianthi*, which may manifest itself in and near the roots or in other and all parts of the plant. It is said to be perpetuated either by mycelium carried in the cuttings and developing with these, or by spores, some of which are thought to live for one or more years on débris and roots in soil and to be carried to sound plants by the operations of cultivation, by manures, and especially by irrigation with a strong dashing stream of water.

As preventive measures, the most critical examination of cuttings is recommended, also rotation of plants so as to give time for all spores to die in the soil.

A disease of the leaves of the garden geranium, ALI RIZA (*Bul. Trimest. Soc. Mycol. France, 28 (1912), No. 2, pp. 148–150, figs. 2*).—The author describes a disease of the leaves of the garden geranium (*Pelargonium peltatum*) which is attributed to *Coniothyrium trabuti* n. sp. A technical description of the fungus is given.

An anomaly of Pelargonium capitatum, P. BACCARINI (*Bul. Soc. Bot. Ital., 1912, No. 4, pp. 67–74, fig. 1*).—The author gives a description of certain excrescences observed on this plant and an account of his studies as to their origin and real nature. Regarding these, however, he offers as yet no very decided opinions.

Polystictus versicolor as a wound parasite of catalpa, N. E. STEVENS (*Mycologia, 4 (1912), No. 5, pp. 263–270, pls. 2*).—During 1911–12 the author has investigated the wood rots of catalpa in Kansas, particularly with reference to second growth stands.

It has been found that the most serious wood rot of living catalpa is caused by *P. versicolor* and that coppice shoots on partly decayed stumps are less

readily infected than are branches of a partly decayed trunk. In examining the diseased material tyloses were found abundant in the outer wood, and there is apparently a constant relation between the presence of the decayed area in the trunk and their formation. In addition to the above species, the author frequently found fruiting bodies of *Trametes sepium* on catalpa stumps.

Diseases of the chestnut and other trees, H. METCALF (*Trans. Mass. Hort. Soc., 1912, pt. 1, pp. 69–95*).—This is an address presented before the Massachusetts Horticultural Society in which an outline account is given of various forest tree diseases, particular attention being paid to the chestnut bark disease (*Diaporthe parasitica*). The relation of the disease to the condition of the tree is discussed, and outlines are given of methods for control, together with the proposed program for combating the disease and preventing its spread.

A bibliography is appended.

Oak Oïdium in France, G. TRINCHIERI (*Bul. Soc. Bot. Ital., 1912, No. 4, pp. 100–102; Jour. Agr. Prat., n. ser., 23 (1912), No. 13, pp. 402, 403*).—This is a brief discussion of the contribution on this subject made by Arnaud and Foëx (E. S. R., 26, p. 551). The present author holds that a more complete comparison and experimental data are necessary before the oak Oïdium of Europe can be safely considered as identified with the American species, *Microsphæra quercina*.

Uredo manihotis injurious to Manihot glaziovii in Brazil, E. ULE (*Tropenpflanzer, 16 (1912), No. 2, pp. 91–95; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 4, p. 1065*).—The author reports that this fungus was found by him to attack rubber trees in the State of Ceará and neighboring regions, causing rust-colored spots on the leaves and large excrescences and witches' brooms on twigs and branches, reducing the yield of rubber, killing the branches, and eventually destroying the trees affected.

Careful pruning out and burning all diseased parts is said to be the only remedy yet found effective.

Prevention of mold, G. G. HEDGCOCK (*Chicago [1912], folio*).—This paper, which was read before the National Slack Cooperage Manufacturers' Association, St. Louis, Mo., May, 1911, gives a brief report on 10 experiments running from 1905 to 1910.

It was found that for the treatment of lumber sodium bicarbonate at a strength of 5 to 8 per cent is, on the whole, the most economical and satisfactory. Some other compounds, notably potash alum and corrosive sublimate, either have not been fully proved or are too dangerous to be unqualifiedly recommended. Kiln drying is stated to be the best preventive of stain due to mold.

The spreading qualities of spraying mixtures, J. WEINMANN (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 33 (1912), No. 23, pp. 709–712*).—This is an account of a series of experiments on the wetting capacity of Bordeaux and Burgundy mixtures with addition of various substances to lower the surface tension and permit greater spreading on the surface treated therewith.

It was found that for the purpose in view ordinary white soap was as effective as a specially prepared soap sold in the form of powder. Polysulphids without soap do not augment the wetting capacity of the mixture, but the two together added to neutral or alkaline Burgundy mixure give excellent results. Sapindus alone was found to give results almost equal to soap alone but inferior to a mixture of the two.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Dictionary of biology, H. SCHMIDT (*Wörterbuch der Biologie. Leipsic, 1912. pp. VIII+581*).—An illustrated biological dictionary.

Mice: Their breeding and rearing for scientific purposes, J. F. DANIEL (*Amer. Nat., 46 (1912), No. 550, pp. 591–604, figs. 4*).—The author describes an intensive method by which he has been able to rear mice in abundance.

The rat and its relation to public health (*Washington: Pub. Health and Mar. Hosp. Serv. U. S., 1910, pp. 254, pls. 9, figs. 59*).—The subject is here dealt with by a number of authors, as follows: Natural History of the Rat, by D. E. Lantz (pp. 15–27); Plague Infection in Rats, by G. W. McCoy (pp. 29–48); Rat Leprosy, by W. R. Brinckerhoff (pp. 49–53); Bacterial Diseases of the Rat, other than Plague and Rat Leprosy, by D. H. Currie (pp. 55–57); Organic Diseases of the Rat, including Tumors, by G. W. McCoy (pp. 59–68); The Ectoparasites of the Rat, by N. Banks (pp. 69–85); The Internal Parasites of Rats and Mice in Their Relation to Diseases of Man, by C. W. Stiles and C. G. Crane (pp. 87–110); Compendium of Animal Parasites Reported for Rats and Mice, by C. W. Stiles and A. Hassall (pp. 111–122); The Flea and Its Relation to Plague, by C. Fox (pp. 123–144); Rodents in Relation to the Transmission of Bubonic Plague, by R. Blue (pp. 145–152); Rodent Extermination, by W. C. Rucker (pp. 153–162); Natural Enemies of the Rat, by D. E. Lantz (pp. 163–169); Rat Proofing as an Antiplague Measure, by R. H. Creel (pp. 171–178); The Inefficiency of Bacterial Viruses in the Extermination of Rats, by M. J. Rosenau (pp. 179–204); Plague Eradication in Cities by Sectional Extermination of Rats and General Rat Proofing, by V. G. Heiser (pp. 205, 206); The Rat in Relation to Shipping, by W. C. Hobdy (pp. 207–213); The Rat as an Economic Factor, by D. E. Lantz (pp. 215–226); and The Rat in Relation to International Sanitation, by J. W. Kerr (pp. 227–254).

Methods of estimating the contents of bird stomachs, W. L. MCATEE (*Auk., 29 (1912), No. 4, pp. 449–464*).—This is a general discussion of methods, called forth by the decided opinions on the merits of the numerical and the percentage-by-bulk methods of estimating the contents of bird stomachs expressed in a work previously noted (E. S. R., 27, p. 52).

The author points out that "the principal objection to the method of reckoning the contents of bird stomachs solely by the number of individual insects or seeds, is that the method takes no account of size of the objects, and hence conveys no idea to those unacquainted with the groups concerned of the relative importance of the food elements. Size has much to do with economic status—i. e., capacity for good or harm—and it receives proper recognition only under the percentage-by-bulk system. . . .

"Numerical notations in most cases greatly exaggerate the importance of elements of the food that have parts very resistant to digestion, a difficulty which is reduced to the minimum when proportions are estimated according to the volumes.

"Numerical systems are not sufficiently comprehensive. Finely comminuted, fleshy, or pulpy food, or food occurring in indefinite masses can not be reckoned by numbers. Under the percentage-by-bulk system, all food can be included in the computations. . . . The ideal system from the writer's point of view is one that combines the good points of both the numerical and volumetric methods—a system which, as a matter of record, counts individuals as far as possible, or at least in enough instances to assure the inclusion of typical cases, and which further estimates the proportion of all important items by bulk."

Report of the entomologist, J. B. SMITH (*New Jersey Stas. Rpt. 1910, pp. 299–373, pls. 7, fig. 1*).—During the course of nursery inspection a new tineid

moth, which has since been described as *Ptochoryctis tsugensis*, was found in some numbers on Japanese hemlock. A scale insect, similar in size and appearance to the San José scale, but which appears to be undescribed, was also found on Japanese hemlock. Mention is made of the possibility that the European red-tail (*Dasychira pudibunda*), a moth widely distributed in continental Europe and parts of Asia which frequently defoliates entire forest areas and is recognized as a first-class pest, ranking with the gipsy and brown-tail moths, has obtained a slight foothold in this country. This moth, which was first collected in Bergen County, N. Y., in 1908, was also taken in 1909, but was not met with during the inspections of 1910. It is a general feeder on deciduous trees of all kinds but favors the beech. Mention is also made of the collection of a European coccinellid in one nursery. Among the other insects mentioned are the shot hole borer, which was the source of considerable injury to peach trees; the grape-berry moth, which was unusually injurious; the pear psylla; and the pear midge, of which there was quite an unexpected recrudescense. A slight infestation of Lawrence pears by the pear midge resulted in their maturing in a twisted and deformed shape. In the opinion of the author the San José scale is on decline so far as its destructiveness is concerned.

The strawberry weevil was the source of considerable injury in Cumberland County and some sections of Cape May County. Observations and experiments with the peach borer and plum curculio are reported. Among the apple insects mentioned are the apple leafhopper, codling moth, yellow-necked caterpillar, and green apple worm (*Xylina* sp.).

Shade and forest insects, the occurrence of which is mentioned, include the elm leaf beetle; elm plant louse; white-marked tussock moth; maple false scale (*Pseudococcus aceris*); cottony maple scale; tulip soft scale (*Lecanium tulipifera*); a leaf beetle (*Lina scripta*) on poplar, which was unusually destructive in nurseries and defoliated many of the smaller trees; the hickory bark beetle; bronze birch borer (*Agrilus anxius*); two-striped chestnut borer (*A. bilineatus*); giant root borer (*Prionus laticollis*); golden oak scale (*Asterolecanium quercicola*); periodical cicada; Chermes on conifers; etc.

Brief notes are also presented on the several insects injurious to field crops. Root maggot observations, by E. L. Dickerson (pp. 353–358), are incorporated in the report. Root maggots were found during the year to develop in wild radishes, thus indicating the desirability of keeping these plants in check. All the specimens reared to adults from wild radishes were *Pieris brassicæ*. Indications point to the fact that while some of the flies live through the winter and oviposit in the spring, hibernation may take place in any of the larval or in the pupal stage. The Chinese mantid (*Tenodera sinensis*) was found at several points in the State where it had been introduced.

Under the heading of insecticides, analyses made of the brands of arsenate of lead offered for sale in the State are reported. A brief account is also given of tests of atomic sulphur, arsenate of iron, blackleaf 40, Nico-sul, and soluble oils, including vacuum oil, Carbolene, Scalecide, U-neek mixture, Spray-on Scale-off, and soluble paraffin.

[Sixth annual report of the department of entomology and zoology], C. J. S. Bethune (*Ontario Agr. Col. and Expt. Farm Rpt. 1911, pp. 25–43*).—The author mentions the occurrence in the Thunder Bay district of an army of black cutworms, which devoured vegetation of all kinds and completely destroyed the crops attacked; the serious infestation of grain bins by the saw-toothed grain beetle (*Silvanus surinamensis*); the work of the predaceous bugs *Perillus bioculatus* and *P. claudus*, which in both adult and nymph stages feed upon the eggs, larvæ, and mature forms of the Colorado potato beetle and in

some localities almost entirely destroy it; the occurrence of the cotton moth (*Alabama argillacea*); and of the subtropical moth *Erebus odora*, specimens of which were collected in Canada.

Biological observations in Europe reported by T. D. Jarvis (pp. 30–38) and a brief report of investigations by L. Cæsar (pp. 38–43) complete the report.

Third annual report of the state entomologist of Colorado for the year 1911, C. P. GILLETTE (*Ann. Rpt. Bd. Hort. Colo., 1911, pp. 99–169, pls. 5*).—This is a detailed account of the horticultural inspection work in Colorado. A report of analyses of samples of arsenate of lead and arsenite of zinc, and of state bee inspection for the year 1911 by W. Foster, are appended.

Seventh annual report of the state entomologist and plant pathologist for 1911, G. M. BENTLEY (*Ann. Rpt. State Ent. and Plant Path. Tenn., 7 (1912), pp. 60, figs. 20*).—A detailed report of the work of the year.

Amended law creating the Tennessee State Board of Entomology: Amended rules and regulations: Apiary inspection law (*Tenn. Bd. Ent. Bul. 6, 1912, pp. 63–76*).—The texts of these laws and rules and regulations are brought together.

The inspection and transportation of nursery stock in Tennessee, other States, and Canada, G. M. BENTLEY (*Tenn. Bd. Ent. Bul. 7, 1912, pp. 31, figs. 7*).—This bulletin has been prepared in response to inquiries concerning the inspection and shipment of nursery stock in the different States and Canada. It gives the names and addresses of the officials having the work in charge and contains revisions of the laws to July, 1912.

[Report of the entomologist], W. W. FROGGATT (*Rpt. Dept. Agr. N. S. Wales, 1911, pp. 52–55*).—This is a brief report of the work of the year and includes an account of the occurrence of the more important insects.

Fall manual of practice in economic zoology, H. A. GOSSARD (*Ohio Sta. Bul. 233, pp. 53–164+VII, figs. 18*).—This is the third of a series, of which the winter and spring numbers have been previously noted (E. S. R., 20, p. 1048). The general principles of practice are first discussed. Under the heading of farm treatment, the author considers the various enemies of field crops and remedies therefor (pp. 58–88). Enemies of orchard and small fruits and remedial treatment are discussed under the heading of orchard practice (pp. 88–151). The bulletin concludes with tabular data as to the insects of the vegetable garden.

Insect enemies of the avocado, P. CARDÍN (*Estac. Expt. Agron. Cuba Circ. 42, 1912, pp. 32–36*).—The more important insect enemies of the avocado in Cuba are the bagworm *Oiketicus poeyi*, a leaf roller, the coconut scale (*Aspidiotus destructor*) and an undetermined species of the same genus, and a leaf-cutting ant (*Atta insularis*).

Technical papers on miscellaneous forest insects.—V, A preliminary synopsis of cerambycoid larvæ, J. L. WEBB (*U. S. Dept. Agr., Bur. Ent. Bul. 20, pt. 5, tech. ser., pp. 149–155, pl. 1*).—In the preparation of the table of the superfamily Cerambycoidea, the author has studied the larvæ of 46 genera of the superfamily Cerambycoidea; 15 being in the family Lamiidæ, 18 in the family Cerambycidæ, 5 in the family Lepturidæ, 5 in the family Prionidæ, and 3 in the family Asemidæ. He proposes the raising of the primary groups Prionini, Asemini, Cerambycini, Lepturini, and Lamiini to family rank.

Relation of insects to the death of chestnut trees, A. D. HOPKINS (*Amer. Forestry, 18 (1912), No. 4, pp. 221–227, pls. 4*).—The author states that 472 insect enemies of chestnut trees have been listed, but that the so-called two-lined chestnut borer is deemed as important as all the others combined. This beetle is on the wing in May and June and deposits its eggs on the bark of

living and dying chestnut, oak, beech, and ironwood in the Southern, Middle, and Eastern States. The larvæ mine in the inner bark and outer wood in such a manner as to girdle the trees.

It is pointed out that insects are more or less responsible for primary wounds through which the spores of the chestnut blight disease find entrance to the living tissue.

Insects bred from cow manure, F. C. PRATT (*Canad. Ent., 44 (1912), No. 6, pp. 180–184*).—This annotated list, which is supplementary to that published by L. O. Howard in 1901, contains 31 species of Diptera, 17 of Coleoptera, and 1 of Lepidoptera.

[Lime-sulphur wash and lead arsenates], R. HARCOURT (*Ontario Agr. Col. and Expt. Farm Rpt. 1911, pp. 85, 86*).—In continuation of investigations of the effect of adding lime to lime-sulphur, the author confirms the results previously obtained (E. S. R., 25, p. 506), finding that there is no objection whatever to the practice of adding lime to lime-sulphur spray, provided the lime is not put in until after the necessary quantity of water has been added to the concentrate to dilute it to the required strength. Analyses of 9 of the more common commercial brands of lead arsenate on the market are reported.

The Minnesota flytrap, F. L. WASHBURN (*Minn. State Ent. Circ. 24, 1912, pp. 3, figs. 3*).—A successful device for catching flies in enormous numbers, which has recently been constructed and put to a practical test by the Minnesota Station, is described and illustrated.

Locusts and some of their parasites (*Bol. Min. Agr. Indus. e Com. [Rome], Ser. C, 11 (1912), No. 2–3, pp. 30–52, figs. 25*).—This paper records observations made in 1910–11 during an invasion of the Province of Palermo, Sicily, by *Dociostaurus* (*Stauronótus*) *maroccanus*. The insect and other parasites of locusts are discussed and references given to the literature.

The control of thrips on tomatoes, J. R. WATSON (*Fla. Grower, 6 (1912), No. 9, pp. 4, 5*).—An outbreak of thrips (*Euthrips tritici*) over most of Florida occurred in the spring of 1912, the most serious injury being done in tomato fields and citrus groves.

"The young upon hatching at once attack the tenderest part of the blossom or bud. . . . This turns black and shrivels up. Soon afterwards the whole flower turns yellow and falls off. If this is repeated for all the blossoms on the first 3 or 4 stands (as was often the case this year) the crop is ruinously shortened."

A mixture consisting of commercial lime-sulphur 2⅓ qt., black-leaf 40 3½ fluid ounces, and water 50 gal., which has been used effectively against the orange thrips in California, was applied during April, 1912, and killed about 75 per cent of the thrips present.

A new genus and three new species of North American Thysanoptera, J. D. HOOD (*Psyche, 19 (1912), No. 4, pp. 113–118, pls. 2*).—*Heliothrips phaseoli*, one of the species here described as new, is reported as very injurious in 1908 to beans in the region of Brownsville, Texas. "Its ravages were so severe that the plants became yellowish and the crop was greatly diminished. Across the Rio Grande in Mexico, near Matamoras, it was found on a species of wild bean which grew along the river bank; and for this reason it would appear that the species is a native one which has lately turned its attention to the cultivated bean."

Some considerations in regard to the classification of the order Thysanoptera, R. S. BAGNALL (*Ann. and Mag. Nat. Hist., 8. ser., 10 (1912), No. 56, pp. 220–222*).—The author erects the new suborder Polystigmata for the reception of the family Urothripidæ.

Papers on deciduous fruit insects and insecticides.—Spraying experiments against the grape leafhopper in the Lake Erie Valley in 1911, F. JOHNSON (*U. S. Dept. Agr., Bur. Ent. Bul. 116, pt. 1, pp. 13, pls. 3, figs. 3*).—This is a report of experiments conducted during 1911 in continuation of those previously noted (E. S. R., 25, p. 152). Owing to the more rapid development of the immature stages of this insect in 1911 than in 1910 there was a partial second brood of considerable proportions in 1911, which greatly augmented the injury toward the ripening season.

Two forms of commercial tobacco extract were used in the experiments, the first (blackleaf extract), containing 2.7 per cent nicotin; the second (blackleaf 40), containing 40 per cent nicotin sulphate. The first, used at a dilution of 1 part of extract to 150 parts water, killed all nymphs that were thoroughly wet with the spray, especially the smaller nymphs, between the first and fourth molts. The second was effective at a dilution of 1 part extract to 1,500 parts water.

"The field experiments made during the season . . . show that a single application of the tobacco extracts applied against this insect in the nymphal stage as a contact spray will reduce its numbers to such an extent that the infested vines will remain in good foliage throughout the season and mature a crop of high-quality fruit.

"As indicated by the variation in the time and rapidity in development of the nymphs in 1910 and 1911, it is evident that no definite date for making the spray application can be given. Where the winged adults are at all numerous in the early part of the season the vineyardist is urged to examine the underside of the grape leaves toward the middle and the end of June and to observe the number and size of the nymphs. The spray application to be most effective should be made at about the time the first nymphs to hatch are near the last molt. This is indicated by the length of the wing pads. At this time the underside of badly infested leaves will be covered by the nymphs in all stages of development. Generally speaking, this condition is likely to occur in the Lake Erie Valley from July 1 to 15. All of the field experiments conducted in 1910 and 1911 were made between these dates and in every instance very satisfactory results were secured."

The aphids attacking Ribes, with descriptions of two new species, F. V. THEOBALD (*Jour. Econ. Biol., 7 (1912), No. 3, pp. 94–116, pls. 2, figs. 14*).—Seven species which attack cultivated and wild currants and gooseberries are dealt with, namely, *Aphis grossulariæ*, *Macrosiphum lactucæ*, *Rhopalosiphum lactucæ*, *R. brittenii* n. sp., *Myzus ribis*, *M. whitei* n. sp., and *Schizoneura ulmi*.

Recent results of spraying experiments for the control of the white fly on citrus, W. W. YOTHERS (*Proc. Fla. State Hort. Soc., 24 (1911), pp. 53–64*).—This paper gives further information as to the value of the formulas previously recommended (E. S. R., 25, p. 153) when used in combating the white fly.

The biology and the treatment of the eudemis and cochylis moths in 1911, J. CAPUS (*Rev. Vit., 37 (1912), Nos. 959, pp. 593–600; 960, pp. 633–638; 961, pp. 681–686; 962, pp. 707–712; 964, pp. 773–778; 965, pp. 818–821; 966, pp. 846–851*).—This article reports investigations of the biology of and remedial measures for the cochylis and eudemis moths.

A fungus disease of bagworms (Isaria psychidæ), I. B. P. EVANS (*Agr. Jour. Union So. Africa, 4 (1912), No. 1, pp. 63–67, fig. 1*).—The author's studies show that the fungus *I. psychidæ* caused a disease among the bagworms from which, when once infected, there was no chance of recovery. Experiments conducted in the laboratory showed that if healthy bagworms were fed on wattle leaves contaminated with the spores or germs of the fungus, the insects contracted the disease in from 4 to 5 days' time and were dead at the end of 7 to

10 days; in less than a month's time the characteristic white fungus cushions had appeared and pushed their way through the bags to the exterior. The results thus far obtained indicate that the pest may be greatly diminished by the use of this fungus.

On the history of the nonne disease, C. von Tubeuf (*Naturw. Ztschr. Forst- u. Landw., 9 (1911), No. 8, pp. 357–377*).—This is a review of investigations made of the wilt disease of the nun moth.

Report on the mosquito work for 1910, J. B. Smith (*New Jersey Stas. Rpt. 1910, pp. 377–424, pls. 3, fig. 1*).—This is a somewhat detailed report of the work of the year, and includes reports on local conditions and on Azolla investigations previously noted (E. S. R., 24, p. 562). Brief notes on the habits of certain mosquitoes are appended.

Fruit fly campaign, W. M. Giffard (*Hawaii. Forester and Agr., 9 (1912), No. 8, pp. 236–239*).—A peculiar condition affecting a large percentage of mango fruits during the present season, at first supposed to have been due to the attack of the Mediterranean fruit fly, has been found to be caused by the mango weevil. The attack of this weevil, which has been exceedingly prevalent throughout Honolulu, is said to bring about fermentation and subsequent rotting of the fruit.

Fannia (Homalomyia) canicularis and F. scalaris, C. G. Hewitt (*Parasitology, 5 (1912), No. 3, pp. 161–174, pl. 1, figs. 7*).—This is an account of the bionomics and of the larvæ of these flies and their relation to myiasis of the intestinal and urinary tracts.

Life history and habits of the "Cayor worm," the larva of Cordylobia anthropophaga, an African muscid, E. Roubaud (*Compt. Rend. Acad. Sci. [Paris], 153 (1911), No. 17, pp. 780–782; abs. in Science, n. ser., 35 (1912), No. 904, pp. 662, 663*).—A report of biological studies of a dipteron the larva of which is a cutaneous parasite.

A catalogue of the Coleoptera (*Coleopterorum Catalogus. Berlin, 1911, pts. 37, pp. 587–742; 38, pp. 100; 1912, pt. 39, pp. 574*).—In continuation of this work (E. S. R., 26, p. 560), part 37, by H. Gebien, completes and indexes the subfamilies, genera, and subgenera of Tenebrionidæ, and also catalogues the Trictenotomidæ; part 38, by J. J. E. Gillet, catalogues the scarabæid subfamily Coprinæ, I; and part 39, by C. Aurivillius, the subfamily Cerambycinæ.

Annual report of the Bee-Keepers' Association of the Province of Ontario, 1911 (*Ann. Rpt. Bee Keepers' Assoc. Ontario, 1911, pp. 103*).—This report consists of the proceedings of the association.

The lore of the honeybee, T. Edwardes (*New York, 1911, pp. XIX+196*).—A popular work.

The life history of Nosema apis, and the significance of the various stages of the parasite in the disease, H. B. Fantham and Annie Porter (*Jour. Bd. Agr. [London], 19 (1912), No. 2, Sup. 8, pp. 57–78, pls. 3*).—The life cycle of *N. apis* in the adult bee is summarized by the authors as follows:

"When the spore is taken up mixed with food, it generally passes forwards into the chyle stomach of the bee before much change occurs in it. Within the chyle stomach the spore wall is softened by the action of the digestive juice of the bee, which penetrates to the spore contents. Stimulated by the juice, the sporoplasm apparently presses the vacuole, with the result that the polar filament is forcibly ejected. It serves for a short time as an organ of attachment, fixing the spore to the gut wall. The sporoplasm concentrates and moves forwards, whereby the polar filament is forced still farther outwards, and becomes disconnected from the spore. The sporoplasm, retaining 2 of the nuclei, creeps out from the sporocyst, leaving the 2 sporocyst nuclei behind. The free sporoplasm becomes amœboid. The binucleate amœbula creeps about over the in-

testinal surface. The nuclei may fuse, or more often, the amœbula proceeds to form daughter amœbulæ. The final active amœbulæ are small, roundish organisms, each with a single nucleus containing a karyosome. Each amœbula is capable of amœboid movement. It penetrates the cells of the gut, or else between them, and finally either enters one of the cells or goes beyond and floats in the hæmocœlic fluid.

"Assuming that it enters an epithelial cell of the gut, it becomes rounded and passive therein, and after a period of growth, during which time it is known as a trophozoite, commences to multiply by several methods. There results usually a collection of separate daughter individuals or meronts, or chains of meronts. The chain condition is somewhat less common than the separate forms in our experience so far. Each meront is uninucleate. Alternatively, a meront may form a large, multinucleate body, in which cleavage into daughter meronts does not occur. Such bodies may be intercellular or intracellular.

"After a period of active growth and division producing uninucleate meronts, spore formation begins. The organism is now called a pansporoblast. Active amitotic nuclear division occurs, resulting in the production of 5 nuclei. Two vacuoles also form in the developing spore, a large one at one end called the posterior vacuole, and a small one at the opposite end, forming the polar capsule. The living body substance or sporoplasm then forms a somewhat ring-shaped mass between the 2 vacuoles, and in it are lodged the 5 nuclei arising by division from the meront nucleus. Two migrate to the sides. These become elongated, and may be termed the sporocyst nuclei. Of the other 3 nuclei, 1 controls for a time the polar capsule, and the other 2 the sporoplasm. The polar capsule gradually forms the spiral polar filament, which extends down into the posterior vacuole. While these nuclear changes are taking place in the sporoblast or young spore, the latter is forming a coat around itself. This spore coat or sporocyst gradually thickens and obscures the nuclei beneath, and the final result is that from one pansporoblast a single spore, resembling a rice grain in shape, with a shining refractile sporocyst is produced. In this condition the spore passes into the lumen of the gut, is voided with the feces, and remains a source of infection for some time.

"It will thus be realized that there are 2 distinct phases in the life cycle of *N. apis* within the bee. This feature Nosema holds in common with other protozoal parasites, such as the coccidium fatal to game birds and poultry. The first part of the life of Nosema is occupied in growth and active division, so that the number of parasites within the host is enormously increased. This multiplicative stage, known as merogony, is the one that is most dangerous to the host. The young stages of the parasite alone are sufficient to kill the bee in many cases, and the parasite as a result may never reach the final or spore stage of its development. Young grouse similarly are killed by the multiplicative stages (merozoites) of *Eimeria* (*Coccidium*) *avium*.

"When the power of the parasite to multiply more in the one host is exhausted or when the bee can no longer supply it with sufficient food, it becomes necessary for the Nosema to leave its host and to renew its development in a new one. Consequently, the parasite must protect itself in order to survive the period between leaving one host and entering the next. As a result of this need the parasite forms a hard outer covering or spore coat, and becomes a spore. The spores are highly resistant to outside conditions, can live for some time without losing their infective power, and so can become new sources of infection for other bees. In other words, merogony of *N. apis* serves for the infection of, and has fatal effects on, a single host; sporogony is a means for the spread of the disease to new hosts."

The authors consider it probable that the cycle in the larvæ follows on exactly the same lines as in the adult.

The morphology and life history of Nosema apis and the significance of its various stages in the so-called Isle of Wight disease in bees (Microsporidiosis), H. B. FANTHAM and ANNIE PORTER (*Ann. Trop. Med. and Par., 6 (1912), No. 2, pp. 163–195, pls. 3, fig. 1*).—The information here presented is included in the article above noted.

The ways in which the disease [Nosema apis] may be spread, G. S. GRAHAM-SMITH and G. W. BULLAMORE (*Jour. Bd. Agr. [London], 19 (1912), No. 2, Sup. 8, pp. 95–118, fig. 1*).—"We have shown that the infection may be transmitted through the agency of infected foods or of living infected bees. Infected water, especially rain water grossly contaminated with excrement in the vicinity of hives, and honey, present in hives in which bees have died, seem to be the most important infected foods. Foraging bees infected by ingesting these foods, and 'parasite carriers,' whether queens, drones, or workers, are the most important agents of infection. The latter may be present in stocks which have never suffered from the disease, or in dwindling stocks showing few symptoms, or in stocks which have suffered from the disease and apparently recovered."

The dissemination of Nosema apis, H. B. FANTHAM and ANNIE PORTER (*Ann. Trop. Med. and Par., 6 (1912), No. 2, pp. 197–214, figs. 2*).—This article is based upon the paper noted above.

The relation of Nosema apis to the Isle of Wight disease, G. S. GRAHAM-SMITH, H. B. FANTHAM, and ANNIE PORTER (*Jour. Bd. Agr. [London], 19 (1912), No. 2, Sup. 8, pp. 39–56, pl. 1*).—"Taking into consideration the following facts, namely, that *N. apis* is met with in 84 per cent of stocks reputed to be suffering from the disease, that infection experiments have proved that the parasite produces a fatal disease in bees, that very marked destruction of the tissues of the alimentary tract is found in severely infected specimens, whether the condition has been produced experimentally or naturally, and that in less marked infections a high proportion of the cells lining the alimentary tract are invaded by the parasites and injured, the writers consider themselves justified in taking the view that *N. apis* is the causative agent in most outbreaks of disease in which the Isle of Wight symptoms are present. . . .

"Experiments have conclusively proved that the spores are capable of producing a fatal disease in healthy bees, but no such experiments have been undertaken with young stages of the parasite only, and up to the present we have no evidence that the young stages are capable of causing infection when fed to healthy bees, although bees in which the young stages only are found die in large numbers. . . . It seems to the writers extremely probable that many of the stocks which recover become partially immune, at any rate for a time, to the effects of the parasite, but still continue to harbor it, and are consequently a source of danger to the noninfected stocks in the neighborhood."

Microsporidiosis in other Hymenoptera.—Infection experiments and observations, G. S. GRAHAM-SMITH (*Jour. Bd. Agr. [London], 19(1912), No. 2, Sup. 8, pp. 131, 132, pl. 1*).—It is pointed out that while the experiments here reported indicate that wild bees and wasps may act as parasite carriers, it has not yet been shown that the Nosema found in naturally infected humblebees is *N. apis*.

Microsporidiosis, a protozoal disease of bees due to Nosema apis, and popularly known as Isle of Wight disease, H. B. FANTHAM and ANNIE PORTER (*Ann. Trop. Med. and Par., 6 (1912), No. 2, pp. 145–160, fig. 1*).—This paper relates to the investigations above noted.

A contribution to the knowledge of Nosema bombycis, J. OHMORI (*Arb. K. Gsndhtsamt., 40 (1912), No. 1, pp. 108–122, pls. 2*).—This is a report of studies of the structure and development of *N. bombycis*, the cause of pebrine in the silkworm, conducted in 1910–11 at the Protozoan Research Laboratory of the Royal Health Department in Berlin.

The poultry tick, D. F. LAURIE (*Jour. Dept. Agr. So. Aust., 15 (1912), No. 12, pp. 1251–1258; 16 (1912), Nos. 1, pp. 10–19, figs. 14; 2, pp. 111–120, figs. 17*).—An account of the life history and bionomics and of preventive and remedial measures for *Argas miniatus*. In tests made to determine the efficacy of certain preparations in destroying the fowl tick, which are here reported in tabular form, kerosene oil appeared to be the most effective and cheapest.

FOODS—HUMAN NUTRITION.

The floating of oysters, J. NELSON (*New Jersey Stas. Rpt. 1910, pp. 209–217*).—The results reported seem in the author's opinion to favor the practice of "floating" oysters, which is widely prevalent in the North. Oysters are kept on submerged floats in water less salt than that of the beds during from 2 to 4 changes of tide, during which time they draw in water as when on the original beds. This process is called "floating," "giving the oysters a drink," "freshening," and "fattening." The resulting advantages are said to be removal of the mud, increased volume of the flesh of the oyster, improvement in color and texture, decrease in amount and rapidity of shrinkage, and better retention of water content in transport and storage.

In the experiments here reported, half of the sample from each bed was floated, then compared with the half not so treated. The results of 25 selected experiments are presented. Except in the case of certain ones injured in handling, oysters were found to regulate the amount and quality of the water they "breathe," opening only when the incoming tide brings water containing a certain proportion of salt, and refusing to open in fresh water. The process of floating enabled the oysters to rid themselves of the dirt brought from the beds, hence the floated product appeared cleaner. An improvement in color was also noted.

"When unfloated oysters were shucked in comparison with floated ones, and the 2 lots were left a few hours in their natural liquor, the former secreted liquor the more rapidly, and also considerable slime, in which the coarser part of the dirt became entangled. This slime became stringy, and the liquor turbid and repulsive, due to the dirt that was mixed with it.

"In strong contrast, was the clean and appetizing appearance of the floated lot; here, at first, the liquor was rather small in amount, but as much as in the former case was finally pressed out, through contraction of the tissues. It seemed that the total slime in the two cases was finally approximately equal, though at the start, the floated lot seemed to be the more slimy."

It is claimed that no deception is involved in the process, since it seems to be impossible to improve the appearance of a poor oyster by it. Water entering the tissues, as it does in the process of floating, is more firmly retained than that held by capillary attraction in the channels of the body, and much more firmly than that between the oyster and the shell. This retained water, the author believes, improves the keeping and cooking qualities. No significance is attached to the loss of flavor, as this is said to be due merely to loss of salt which can easily be replaced before serving. It appears to be impossible to have the floats near the beds, or at least it is much more convenient to have them near the store-houses. The author concludes that the practice of float-

ing is not injurious if the water in which the oysters are floated is pure, and that the practice is desirable on account of the improvement in the oyster. It is suggested that both floated and unfloated oysters be admitted to the market, since a demand for both kinds exists, and in time the demand for the floated product will be so great as to give it the greater value.

The author notes that the experiments are rather limited and that a more prolonged study of the question may be desirable.

Decay and preservation of eggs, A. Kossowicz (*Monatsh. Landw., 5 (1912), No. 2, pp. 43–49; abs. in Schweiz. Wchnschr. Chem. u. Pharm., 50 (1912), No. 28, p. 420*).—Contamination of the egg by micro-organisms may occur while in the ovarian duct, but not after it is laid until age causes loss of resistance.

No organisms had entered eggs 4 weeks old; only *Cladosporium herbarum* had entered after 8 weeks, *Phytophthora infestans* after 12 weeks, and *Rhizopus nigricans* after 5 months. The germicidal power of the albumin decreases rapidly with age. In addition to his own work the author summarizes data from a large number of experiments by others.

Curing of Italian hams, J. A. Smith et al. (*Daily Cons. and Trade Rpts. [U. S.], 15 (1912), No. 249, pp. 385–388*).—Methods of curing hams in different parts of Italy are given in detail.

Mince-meat and mock mince-meat (*Pure Products, 8 (1912), No. 10, pp. 555–557*).—The results of the examination of about 500 recipes for mince-meat are given and suggestions for another standard are made.

The manufacture of gelatin, L. A. Thiele (*Jour. Indus. and Engin. Chem., 4 (1912), No. 6, pp. 446–451, figs. 4, dgms. 3*).—This description of the manufacture of gelatin treats of cleaning the raw material, dissolving the gelatin, concentrating the solution, chilling and spreading, drying, and finishing (grinding and packing). Curves show the imports of gelatin and price fluctuations during the past 8 years.

High fat standard for ice cream, M. Mortensen (*N. Y. Produce Rev. and Amer. Cream., 34 (1912), No. 17, p. 754*).—Standards and definitions are suggested favoring a high fat content (at least 12 per cent) of butter fat in ice cream.

Wheat and flour, R. Harcourt (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 37 (1911), pp. 73–84*).—In continuation of earlier work (E. S. R., 25, p. 564), experiments with wheat and flour were carried on. A comparison of commercial flours (patent and bakers' grades), freshly ground from the crop of 1911 wheat, showed that such flour was only slightly lower in gluten and in water absorption, and in yield of bread and size of loaf was fully equal to the 1910 crop, while some superiority in the texture of the crumb was noted.

Baking tests with winter wheats grown on experimental plats and ground in a small mill showed superiority in the 1911 crop over that of 1910. "With 2 or 3 exceptions the loaf was larger and the crumb of the bread was better, both in color and in texture." The apparently better results obtained from the 1909 crop, as compared with those of 1910 and 1911, was partly due, in the author's opinion, to longer aging.

Baking tests with Ontario spring wheats grown on experimental plats showed that, in the majority of cases, the 1910 crop contained less gluten than that of 1909, while the reverse was the case with regard to absorption. "The yield of bread, consequently, is higher, but the volume of the loaf is less. Generally speaking, the quality of the bread from the 1910 crop is inferior to that of the 1909."

As regards varieties, the old Red and White Fife wheats still hold a good place, while Preston Spring, Gatineau, and Hungarian gave a rather larger volume of loaf of about equal quality.

Baking tests reported with sprouted wheat represent work by A. J. Galbraith and submitted in a thesis. Ontario soft winter wheat and Manitoba spring wheat of medium grade were selected. Samples, allowed to germinate until the sprouts were equal to the length of the kernel, to about twice the length of the kernel, and to about 1½ inches long, were compared with ungerminated wheats. As was expected, the flours from these wheats "showed considerable difference in appearance. That from the least sprouted wheat had the best color, while that from the more extended germination was very dark. On washing out the gluten it was found that the flour from the wheat with the shortest sprouts handled quite normally. The gluten from the second sample was rather soft and runny, and the third was so poor that it was impossible to make a satisfactory determination of the amount of it present."

The bread-making tests showed that the flour from wheat which was least germinated yielded bread superior in color, texture, and general appearance of the loaf to that obtained from the normal unsprouted wheat. The more extended germination allowed in the other wheats injured the quality of the gluten and apparently more in the case of the winter than of the spring wheat.

A study of the nitrogen of the sprouted and unsprouted wheats showed that "the quantity of alcohol-soluble nitrogen is apparently not influenced by the germination, but the salt-soluble compounds are slightly, and the amids very materially affected." While it was not possible to study definitely the effects of the nitrogen compounds on the bread-making quality of the flour, "the results do show that while the alcohol-soluble and gliadin nitrogen remains unchanged, the amount of glutenin nitrogen decreases and the amid nitrogen increases. Apparently the destruction of the gluten is accompanied by these changes."

A study of the carbohydrates showed that, as might be expected, "the percentage of starch present in the grain decreases and the soluble carbohydrates increase. These soluble carbohydrates and the soluble protein are essential food constituents of the yeast, and possibly the better quality of bread obtained from the slightly sprouted wheat was due to the extra food materials present. On the other hand, too large an amount of the soluble carbohydrates in the flour or dough is always associated with a poor color and texture of bread, and even if the gluten was not destroyed by the longer germination, it is probable that the bread made from these samples would not have been so good as that obtained from the normal wheat. Apparently the bread-making value of the wheat is improved by germination provided this is not continued too far. When this has taken place, the dough 'works' very fast, doubtless due to the large amount of available food present, but the dough will not 'rise' properly because the gluten, or, at least, the tenacious nature of the gluten, has been destroyed."

How bread becomes stale, J. R. Katz (*Pharm. Weekbl., 49 (1912), No. 27 pp. 618–631*).—From various experiments it appears that bread in becoming stale loses but little water, the crumb losing from 1 to 2 per cent but the crust gaining from 8 to 9 per cent. There is a decrease in the amount of water-soluble dextrins in the crumb, the crust remaining almost unchanged.

Reheating appears to restore to stale bread many of the properties of fresh bread. Apparently the degree of staleness is determined by the presence of some compound which is unstable at high temperatures.

The bacterial contamination of bread, Katharine Howell (*Amer. Jour. Pub. Health, 2 (1912), No. 5, pp. 321–324; abs. in Med. Rec. of Reviews, 18 (1912), No. 9, pp. 589, 590*).—One hundred loaves of bread, wrapped and unwrapped, were collected from shops in Chicago. Dirty loaves gave an average bacterial count of 64,970 per loaf, loaves from fairly clean shops 3,117,

and from thoroughly clean shops 835. None of the dirty shops kept wrapped bread. Wrapped bread from fairly clean shops showed a count of 848, and from the best shops 371.

Yoghourt bread (*Pure Products, 8 (1912), No. 10, p. 560*).—The substitution of milk containing the *Bacillus bulgaricus* for part of the water used in bread making is said to give a pleasant and characteristic flavor, especially in the case of rye bread.

Natural pure culture and yoghourt making, W. Henneberg (*Ztschr. Spiritusindus., 35 (1912), Nos. 30, pp. 405, 411; 31, pp. 415, 416; 32, pp. 427, 428; 34, p. 454*).—Experiments are reported which have to do with the cultivation of the yoghourt bacillus by dry and wet methods.

On a new glucolytic ferment of yeast, V. Birckner (*Jour. Amer. Chem. Soc., 34 (1912), No. 9, pp. 1213–1229*).—The ferment which occurs in California "steam beer" yeast accelerates the decomposition of glucose at high temperatures; is active at 70° F.; is not zymase; causes no gas formation; yields no alcohol; rapidly darkens glucose at 70°, giving a strongly acid reaction with gradual formation of a caramel-like deposit; is stable at room temperature in aqueous solution; is not destroyed by boiling; is active in neutral or acid solution against glucose, polyphenols, and lactates; contains no tyrosinase; does not act as a peroxidase against glucose; gives a strong pyrrol reaction; and appears to belong to the zymases although having some characteristic of the oxidases. The cleavage products are mostly acid and contain pentose and formaldehyde.

[Macaroni], L. Lodian (*Amer. Miller, 40 (1912), No. 10, pp. 786, 787*).—This is a description of macaronis made from beans, buckwheat, whole wheat, rice, wheat and rice, milk (casein), chestnuts, tree pith, and seaweed.

On the starch of glutinous rice and its hydrolysis by diastase, Y. Tanaka (*Jour. Indus. and Engin. Chem., 4 (1912), No. 8, pp. 578–581*).—Instead of a blue coloration, the starch of glutinous rice gives a red coloration with iodin, due to the characteristic nature of the starch itself, and not to the presence of dextrins or albuminoids.

The glutinous rice starch contains none of the common starch which gives a blue coloration with iodin. The glutinous rice starch is rapidly hydrolyzed by diastase to dextrin with less production of maltose than given by potato or common rice starch. The author believes that the glutinous rice starch contains amylopectin or other analogous constituent which produces a dextrin less rapidly hydrolyzed than ordinary starch by diastase. Several other cereals were found to contain a similar starch.

Nutritive value and use of soy beans as food, H. Neumann (*Berlin. Klin. Wchnschr., 49 (1912), No. 36, pp. 1710–1714*).—Conclusions favorable to the use of soy beans are drawn from the author's tests and a summary of the work of others.

The author notes that he found soy beans to increase the milk of nursing women.

Concerning the sugar content of watermelons, C. P. Sherwin and C. E. May (*Jour. Indus. and Engin. Chem., 4 (1912), No. 8, pp. 585–588*).—Analyses were made of unusually sweet watermelons with thin rinds.

They had 43 per cent juice, 47 per cent rind, and 10 per cent pulp; the ash content was about 0.25 per cent of the juice, $\frac{1}{8}$ of the ash being insoluble. Fermentation of the sugar produced a 2.5 per cent alcohol solution by weight, and from the fermented juice a 1.75 per cent acetic acid solution. The Fehling titration method showed 5.5 per cent of reducing sugar in the juice, and the polariscope a smaller quantity. About 1 per cent of the juice was sucrose.

The palm cabbages of Madagascar, H. JUMELLE and H. P. DE LA BATHIE (*Compt. Rend. Acad. Sci. [Paris]. 155 (1912), No. 13, pp. 587–589*).—A brief description of several Madagascan varieties of palm having edible heads is given.

Cholera and tomatoes, R. RICCIARDELLI (*Bol. Chim. Farm., 50 (1911), pp. 573–575; abs in Ztschr. Untersuch. Nahr. u. Genussmtl., 24 (1912), No. 3, p. 250*).—According to the author, the acid content of tomatoes (0.81 per cent citric acid, with traces of tartaric, malic, and oxalic acids) acts as an intestinal disinfectant.

Vegetables and typhoid fever (*Brit. Food Jour., 14 (1912), No. 161, p. 83*).—Quoting from the *Medical Press*, experiments are reported in which typhoid bacilli were found on lettuce grown in soil inoculated with the culture 31 days before gathering the plants.

Three consecutive washings in distilled water failed to remove the bacilli entirely. The dangers of using uncooked vegetables and of using human excreta as a fertilizer are emphasized.

The relatively high dextrose content in certain preserved fruits, FAVREL and GARNIER (*Jour. Pharm. et Chim., 7. ser., 4 (1911), No. 6, pp. 253–255; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 24 (1912), No. 7, p. 473*).—Determinations of the different sugars in dried apricots and mirabelle plum juice are reported and the results discussed with reference to the preserved fruits.

Commercial table sirups and molasses, W. FREAR (*Penn. Dept. Agr. Bul. 224, 1912, pp. 97*).—From an extended study, including the examination of a large number of samples of table sirups and molasses on sale in Pennsylvania, a number of general conclusions were drawn, from which the following are quoted:

"The goods sold as 'maple sirup' are, with few exceptions, true to name. . . . The sirups labeled 'maple and cane' or 'cane and maple', usually contain only small proportions of the maple product. There is little sugar cane sirup on the market.

"The molasses on sale is practically confined to the products of the modern sugar-house. The 'New Orleans molasses' of to-day differs materially in flavor, sugar richness, and probably also in acidity from the older 'open kettle' product formerly sold under that name. The ash limits for table molasses are exceeded in but few cases, but the organic solids not sugar are, in some cases, so high as to suggest that the molasses in these cases is of very inferior grade. The quantities of sulphur dioxid are usually not high. The presence of tin and zinc in small quantities is common, and, in the latter case, suggests the need for greater care in cleansing before filling the tins in which these goods are usually retailed.

"The samples of refined molasses submitted were too few to permit any judgment of their average quality as compared with that of the ordinary molasses.

"The 'corn sirup with cane flavor' and 'compound molasses' formed a large fraction of the 'table sirups' on sale. The goods of the former class frequently lack cane flavor, in the literal sense of the term. The proportions of glucose claimed on the labels are rarely exceeded in the goods. As a class, these goods contain more water than should be introduced in the ingredients named. The proportions of sulphur dioxid present are, as a rule, very low, indicating that the glucose now used for these mixtures is practically free from this constituent, which was formerly found in larger amounts.

"Sulphur dioxid appeared, in a few cases, in classes of sirups not covered by the proviso of the food law that tolerates it, within certain limits and under certain conditions, in molasses.

"In no case was saccharin, benzoic acid, or salicylic acid found present.

"The labeling of many of . . . [the] samples [examined] was open to objection."

The rôle of caffein in the cardiac action of coffee, H. BUSQUET and M. TIFFENEAU (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 5, pp. 362–365*).—From experiments with isolated rabbit heart and with a dog the authors conclude that caffein is apparently the principal agent in the cardiac action of coffee.

Coffee substitute, L. FARCY (*Ann. Falsif., 5 (1912), No. 45, pp. 361, 362, figs. 4*).—A Swiss coffee substitute was found by chemical and microscopical examination to contain about 50 per cent of caramel, 25 per cent of chicory, from 10 to 12 per cent of parched barley, and about the same amount of coffee.

"Ochsena", a so-called vegetable meat extract, C. REESE and J. DROST (*Ztschr. Untersuch, Nahr. u. Genussmtl., 24 (1912), No. 3, pp. 240–244*).—Analytical data are reported and discussed.

Regulation regarding tinning of culinary utensils, A. GAUTIER (*2. Cong. Internat. Hyg. Aliment. Bruxelles [Proc.], 1 (1910), Sect. 3, pp. 57–62; Bul. Soc. Sci. Hyg. Aliment., 1 (1911), No. 1–2, pp. 189–193*).—Laws prescribing the permissible proportion of lead in tin plate of culinary utensils in France, Germany, Belgium, and other countries are cited. England has no such laws. The permissible amount is deemed from ½ to 1 per cent of lead. Five per cent has been found to be injurious, and in tinning of soldered utensils the tinning bath may gradually acquire as much as this from the solder. The author believes that the French regulation, permitting the use of tinning baths containing ½ per cent of lead, is reasonable.

Rules and regulations for carrying out the provisions of the food and drug law of Connecticut—revision of January 1, 1912 (*Hartford, 1911, pp. 36*).—Detailed instructions for carrying out each of the regulations are given.

Laws of Wyoming providing for pure food, drugs, drink, and illuminating oils (*Cheyenne, Wyo., 1911, pp. 16*).—The laws of Wyoming relating to the manufacture and sale of foods, drugs, beverages, and illuminating oils are given.

Eighteenth annual report of the dairy and food commissioner of the State of Michigan for the year ending June 30, 1911, G. M. DAME (*Ann. Rpt. Dairy and Food Comr. Mich., 18 (1911), pp. 192*).—This volume contains new legislation relating to the sale of adulterated candies, advice on the care of milk in hot weather, reports of food, dairy, drug, and apiary inspections, the state analyst's report of analyses of miscellaneous foodstuffs and feeds, and other similar data.

Preliminary report of the dairy and food commissioner for the year 1911, J. FOUST (*Penn. Dept. Agr. Bul. 221, 1912, pp. 45*).—This report contains expositions of the State pure food laws passed in 1911, relating to sausage, milk, and cream. Brief summaries of inspections of various foodstuffs are also given.

Feeding children for efficiency, W. S. CORNELL (*Forecast, 4 (1912), No. 4, pp. 125–128, figs. 2*).—Arguments for the school lunch are presented, with sample menus of meals that can be served for 3 cts.

Tests with 362 children are referred to which indicate that those who received school lunches gained considerably more in physical measurements (weight, height, hand strength, and lung capacity) during 6 months, than those who did not receive the lunches. Tests with 40 other children for 3 months showed that the fed children gained slightly more than the unfed in lesson and conduct averages.

Some fundamental principles in studying infant metabolism, F. G. BENEDICT and F. B. TALBOT (*Amer. Jour. Diseases Children, 4 (1912), No. 3, pp. 129–*

136, figs. 4).—Work of previous experimenters is criticized on the ground that sufficient account has not been taken of muscular activity.

In the experiments here described graphic records of muscular activity were made. The periods of observation were short and as far as possible while the infants were asleep. The energy measurements were made indirectly by measuring the gaseous exchange.

A close relation was found between carbon dioxid production, pulse rate, and muscular movements. The pulse rate in the younger infants was much less stable than in the older infants, the slightest motion causing marked increase of the rate. A description and a diagram of the apparatus used are given.

A consideration of some chemical transformations of proteins and their possible bearing on problems in pathology, F. P. Underhill (*Arch. Int. Med., 8 (1911), No. 3, pp. 356–381*).—Chemical changes in proteins during the process of digestion are considered, together with their possible relation to pathological conditions.

The sparing value of fats, A. Bartmann (*Ztschr. Biol., 58 (1912), No. 8–11, pp. 375–419, dgms. 5*).—Experiments in which dogs were fed lard and later raw fat pork showed that the sparing value of fat was constant, being about 7 per cent.

An efficiency curve of the fat was obtained by platting the sparing value against the amount fed. This curve reaches its maximum at about 150 per cent of the necessary energy supply. Feeding large amounts of fat caused increased elimination of nitrogen through the alimentary tract.

Water balance in rest and in mountain climbing, G. Galeotti and E. Signorelli (*Biochem. Ztschr., 41 (1912), No. 3–4, pp. 268–286*).—Water excretion through the kidneys, lungs, and skin was not affected by altitude alone, but in mountain climbing as much as 4.2 liters passed through the skin in a day. The weight so lost was quickly regained.

The physiological significance of the segmented structure of the striated muscle fiber, R. L. Lillie (*Science, n. ser., 36 (1912), No. 921, pp. 247–255*).—In this paper two views of the cause of muscular contraction are contrasted, namely, that the process is analogous to the absorption of water by a sheet of acidulated gelatin, and that the process results from transformation of surface energy of the ultimate structural elements or colloidal particles (submicrons) composing the fibrils.

A comparative study of temperature fluctuations in different parts of the human body, F. G. Benedict and E. P. Slack (*Carnegie Inst. Washington Pub. 155, 1911, pp. 73, figs. 38*).—The purpose of these investigations was to determine the best place for accurate and constant measurement of body temperature, the temperature gradient of the body, and whether or not the temperature fluctuations are uniform in different parts of the body. The thermal junction apparatus used is described in detail.

The conclusion is reached that, aside from the skin temperature, the temperature of the rectum or of the vagina is the best index of body temperature.

A bicycle ergometer with an electric brake, F. G. Benedict and W. G. Cady (*Carnegie Inst. Washington Pub. 167, 1912, pp. 44, figs. 16*).—An apparatus designed to measure the amount of mechanical work done by a man, and essentially the same as that in use at this Department (E. S. R., 21, p. 68), is described. It consists of a bicycle the rear wheel of which is a copper disc, rotating between the poles of an electro-magnet. The calibration of the instrument is described and a study reported of the magnetic reactions in the disc.

ANIMAL PRODUCTION.

The principles of Mendelian inheritance and their cytological foundation, F. PÉCHOUTRE (*Rev. Gén. Sci., 23 (1912), No. 16, pp. 613–623, figs. 3*).—This is a review and critical discussion of Mendelism, with special reference to the function of the chromosomes.

Gametic coupling as a cause of correlations, G. N. COLLINS (*Amer. Nat., 46 (1912), No. 550, pp. 569–590*).—It is pointed out that the theory that the various degrees of association in gametic coupling fall into a regular series, represented by powers of two, has been accepted without adequate analysis of data. To overcome the lack of a standard for making comparisons the author advocates the use of Yule's coefficient of association.[a]

From studies of maize and other hybrids the author finds that in several cases correlations are reversible, depending on the way the characters were combined in the parents. This fact makes it necessary to assume that characters which at one time attract each other, at other times exhibit repulsion.

The general conclusion reached is that associations between characters, like the appearance of single characters, may arise at different stages in the ontogeny of the individual.

Another view of sex-limited inheritance, R. M. STRONG (*Science, n. ser., 36 (1912), No. 927, pp. 443–445*).—In the first generation of crosses with white ring doves (*Turtur alba*) and blond ring doves (*T. risorius*) the hybrids resembled one parent or the other in equal numbers. The blond hybrids were mostly males and the white hybrids were all females. When these latter were crossed back on white males only white offspring were obtained, and are therefore so-called extracted recessives. An explanation is given to account for these results without assuming that the male is homozygous for sex and the female heterozygous, or that a spurious allelomorphism may exist with the consequence that certain sex and somatic factors may not be present in the same gamete.

Another sex-limited character, E. N. WENTWORTH (*Science, n. ser., 35 (1912), No. 913, p. 986*).—The rudimentary mammæ located on the scrotum of the male and on the inside of the thigh of the female swine appear to be a case of sex-limited inheritance in a manner similar to the inheritance of the horns in Wood's crosses in sheep (E. S. R., 22, p. 378).

The genetic factors in the development of the house mouse which influence the coat color, A. L. HAGEDOORN (*Ztschr. Induktive Abstam. u. Vererbungslehre, 6 (1912), No. 3, pp. 97–136, pl. 1*).—A detailed study of the inheritance of coat color in over 6,000 animals.

The sex ratio in hybrid rats, HELEN D. KING (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 21 (1911), No. 2, pp. 104–112*).—This reports data of experiments with hybrid rats in which the excess of mayes was so far beyond the limits of normal variation that it appears that hybridizing altered the sex ration to an appreciable extent. This is in agreement with the results obtained by other observers.

Studies in the experimental analysis of sex.—IX, On spermatogenesis and the formation of giant spermatozoa in hybrid pigeons, G. SMITH (*Quart. Jour. Micros. Sci., n. ser., 58 (1912), No. 229, pp. 159–170, pl. 1*).—These are studies of normal male pigeons and doves and 3 male hybrids produced by the mating of a male pigeon with a female domestic dove. As a rule the findings of Guyer[b] were confirmed. The following conclusions were drawn:

"The ripe spermatozoa of the hybrids, which were present in large quantities, besides showing in certain cases structural abnormalities, were on the average twice as large as the normal spermatozoa of either parental type.

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[a] Phil. Trans. Roy. Soc. London, Ser. A, 194 (1900), pp. 257–319.

[b] Diss., Univ. Chicago, 1900; Biol. Bul., 16 (1909), p. 193; Anat. Anz., 34 (1909), pp. 502, 573.

"The first maturation or reduction division in the hybrids is abnormal, in that the chromosomes do not enter into the normal synapse to produce S synaptic or bivalent chromosomes, but they are scattered as irregular chromatic masses of unequal size on the mitotic spindle, and are irregularly distributed to the opposite poles of the spindle.

"The second maturation division in the hybrids is almost entirely suppressed, the secondary spermatocytes proceeding without further division to form spermatids and spermatozoa of twice the normal size. Many of these spermatozoa are structurally normal, apart from their double size, while others are abnormally twisted or beaded. All the spermatozoa were probably impotent, since these hybrids and all others of a similar kind are invariably sterile.

"The explanation of the sterility of such hybrids is found, in accordance with Guyer's idea, to reside in the disturbance of the synaptic division during maturation, this disturbance being due to the incapability of the chromosomes derived from the specifically different parents to fuse to form the normal synapses."

The male generative cycle in the hedgehog; with experiments on the functional correlation between the essential and accessory sexual organs, F. H. A. MARSHALL (*Jour. Physiol., 43 (1912), No. 3–4, pp. 246–259*).—Recent studies of the sex glands of the hedgehog, combined with previous investigations of other animals, led the author to the following conclusions:

"The males of most, if not all, wild mammals experience a definite sexual cycle, the testes and accessory generative organs passing through alternate periods of rest and activity, but in the domesticated varieties and in man the period of rest is liable to be much reduced or may be absent altogether. . . . The vesiculæ seminales are secretory glands, and do not contain spermatozoa either in the breeding or in the nonbreeding season. Complete castration during the period of rest prevents the seasonal development of the vesiculæ seminales and other accessory male organs, or, if such development has already begun, arrests its further progress. Unilateral castration, however, does not inhibit the growth of the accessory organs and has no effect on the symmetrical arrangement of these organs. Vasectomy, either unilateral or double, does not inhibit the growth of the vesiculæ seminales or other accessory organs, but unilateral vasectomy may prevent the full development of the testis on the side of the operation, as compared in size with the testis on the unoperated side. The periodic development of the accessory organs is not due to stimuli set up by sperm ejaculation, but is probably the result of an internal testicular secretion elaborated in the interstitial tissue during the season of generative activity."

The maturation divisions of the mammalian ovum, M. ATHIAS (*Arch. R. Inst. Bact. Camara Pestana, 3 (1912), No. 3, pp. 287–370, pls. 4*).—A study on the segmentation of the ovum in the cat, rat, mouse, and other small mammals. A bibliography is appended.

Development of new feathers, FRIEDA BORNSTEIN (*Arch. Naturgesch., 77 (1911), I, Sup. 4, pp. 1–11, pls. 2; abs. in Jour. Roy. Micros. Soc. [London], 1912, No. 3, p. 299*).—This is a study of the histology of the feather in young ducks, pigeons, and other birds.

"A new germ is always formed for a new feather: the new germ arises while the old feather is still growing; it is formed from the malpighian layer, at one side of the base of the feather follicle. The new feather germ forms a process which grows into the deeper layers of the cutis, and from this process the new papilla is formed. The old papilla atrophies after the old feather falls off. A study of the foot of the capercaillie, where feathers and scales occur in close

association, led to the conclusion that a feather corresponds not to an entire scale but only to part of a scale, the rest being suppressed."

A bibliography is appended.

Hard tendons of birds, E. RETTERER and A. LELIÈVRE (*Compt. Rend. Soc. Biol. [Paris], 71 (1911), No. 35, pp. 596–599; abs. in Jour. Roy. Micros. Soc., [London], 1912, No. 3, p. 303*).—The so-called "ossified" tendons in birds were found to be due to hypertrophied tendinous tissue, the cells becoming vesicular and the fibers calcified. Around the vascular canals there is a delicate zone of vesicular cells, which take on the characters of true bony tissue.

The psychological basis of domestication, P. HACHET-SOUPLET (*Rev. Sci. [Paris], 50 (1912), II, No. 10, pp. 294–299*).—A study of the domestication of wild animals and birds from the psychological standpoint. The author advocates the establishment of a central institution for domesticating game birds for the purpose of replenishing the farms, fields, and forests of France with new species.

Stock breeding in the Catanduanes Islands, E. H. KOERT (*Philippine Agr. Rev. [English Ed.], 5 (1912), No. 6, pp. 305–308, pl. 1*).—This contains brief notes on the carabao, Catanduanes pony, goats, swine, and native cattle of the Catanduanes Islands.

Cattle business in Paraguay, C. FERRIS, Jr. (*Daily Cons. and Trade Rpts. [U. S.], 15 (1912), No. 181, pp. 586, 587*).—This contains information on general conditions of cattle raising in Paraguay.

Origin and descent of the Norwegian breeds of cattle, J. FROST (*Amer. Breeders Mag., 3 (1912), No. 3, pp. 216–221*).—A translation of an article previously noted (E. S. R., 27, p. 277).

Transmission of color and color markings in Hereford-Shorthorn crosses, P. E. FOGLE (*Amer. Breeders Mag., 3 (1912), No. 3, pp. 201–204*).—A progress report by a committee on animal hybrids of the American Breeders' Association.

Among the facts regarding the transmission of color and color markings which are regarded as well founded are the following: "The circle around the eyes would seem to go with the solid red color, as the greater number of red calves carry the characteristic eye circle. The fact that out of 16 roan calves 15 have no red markings on face (having only imperfect eye circles) strongly points to the dissociation of eye circles with roan color. The cross of red and white results in roan, and the roan cow, having received red from one parent and white from the other, transmits the red to about half her offspring and roan to the other half, so that about half the calves from a roan cow bred to a Hereford bull will be red and the other half roan."

British breeds of sheep, R. WALLACE (*Pastoralists' Rev., 21 (1911), Nos. 8, pp. 841, 842; 9, pp. 952–954; 21 (1912), Nos. 11, pp. 1160, 1161, figs. 8; 12, pp. 1320, 1321, figs. 2*).—An account of the origin and characteristics of the following breeds of sheep: Cheviot, English Leicester, Border Leicester, Wensleydale Longwool, Lincoln, Kent or Romney Marsh, Devon Longwool, South Devon, Cotswold, Roscommon Longwool, Dorset Horn, and Ryeland.

Concerning the fat-tail and the broad-tail sheep, C. C. YOUNG (*Amer. Breeders Mag., 3 (1912), No. 3, pp. 181–200, figs. 9*).—This describes the characteristics of the breeds of sheep which have originated from the 2 species *Ovis steatopyga* (fat-tail), and *O. platyura* (broad-tail). See also a previous note (E. S. R., 25, p. 675).

Monograph on the vicuña, C. G. MADUEÑO (*Trab. 4. Cong. Cient. Santiago de Chile, 2 (1908-9), pp. 5–30, pls. 2, figs. 5*).—This contains an account of the

history, characteristics, and value for agriculture of the vicuña, which has previously, in the opinion of the author, been underestimated.

Experiments in swine feeding, G. E. DAY (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 37 (1911), p. 150*).—A brief report of progress in swine feeding tests.

Skim milk at 20 cts. per hundredweight proved a cheaper source of protein than oil cake at $36 per ton, but in the absence of skim milk the latter may constitute 10 per cent of the total meal ration. The use of low-grade flours for pig feeding was unprofitable. The amount of water supplied to pigs is thought to be an important factor in growth. The best results were obtained by mixing the meal with enough water to make a thick slop.

Horses and practical horse keeping, F. T. BARTON (*London [1912], pp. 643, pls. 47, figs. 23*).—A practical handbook on the horse dealing with breeds, breaking, management, lameness, diseases, etc.

The horse and its relatives, R. LYDEKKER (*London, 1912, pp. XII+286, pls. 24, figs. 11*).—An account of the natural history of the horse, mule, ass, kiang, and zebra, and their extinct forerunners. The work was written for breeders, racing men, antiquarians, naturalists, and big-game hunters.

Horse breeding (*London: Board of Agriculture and Fisheries, 1912, pp. 69*).—This is the preliminary report of the Animals Division as to the administration of the grant under the Development Act for the encouragement and improvement of the light horse breeding industry.

A history of the Arabian horse and its influence on modern breeds, F. KNORR (*Amer. Breeders Mag., 3 (1912), No. 3, pp. 174–180, figs. 3*).—A brief historical survey.

The evolution of a type of horse, W. S. ANDERSON (*Amer. Breeders Mag., 3 (1912), No. 3, pp. 209–216, figs. 2*).—A discussion of how a type of saddle horse has been developed by the elimination of undesirable unit characters. The following working hypothesis is suggested:

"The unit characters of the horse may, in a tentative way, be stated to be as follows: That the finer qualities are recessive to the coarse ones; as the thin, pointed ear is recessive to the heavy thick one; the clean, small head recessive to its opposite; the short neck recessive to the long one; the flat foot recessive to the 'mule' foot; the calf knee dominant to the straight, perfect knee; strength dominant to weakness; true action and superior action recessive to untrue and inferior action. In color, chestnut is recessive to gray, bay, and black."

Mendelian experiments with Thoroughbred horses, C. C. HURST (*Bloodstock Breeders' Rev., 1 (1912), No. 2, pp. 86–90*).—An outline of an experiment recently undertaken to produce from Thoroughbreds a race of steeplechasers which will breed true.

The other side of the question (*Bloodstock Breeders' Rev., 1 (1912), No. 2, pp. 90–92*).—A criticism of the above, mainly on the ground that there is no such thing as a Mendelian factor for jumping.

The figure fallacy (*Bloodstock Breeders' Rev., 1 (1912), No. 1, pp. 37–40*).—The weak points in breeding horses by the Bruce-Lowe figure system are pointed out.

Tests of grain and hay for work horses, H. J. WATERS (*Breeder's Gaz., 61 (1912), No. 13, pp. 763, 764, fig. 1*).—These tests were made with artillery horses at the Fort Riley military reservation. There were 10 lots with about 75 in each lot, and 7 lots containing from 17 to 20 horses each. Most of the experiments lasted from 110 to 140 days each.

The cheapest ration, and the one which gave the largest gains, consisted of 8 lbs. of corn, 2 lbs. of oats, and 10 lbs. of alfalfa hay, and cost 13 cts. per

head per day. The gain made was 25.6 lbs. per horse in 140 days. A ration consisting of oats, corn, wheat bran, and timothy hay in the ratio of 4:6:4:12 produced 6 lbs. of gain in 120 days, and the animals showed the best condition of any in the test, but the ration cost 19 cts. per day. When oil meal was used to replace a portion of more expensive grain at the rate of about 1 lb. per day the horses showed excellent condition and there was no evidence of softness. This cheapened the ration about 2 cts. per day over the ration previously used.

[Report of] the professor of poultry husbandry, W. R. GRAHAM (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 37 (1911), pp. 159–167*).—During the year 23 bred-to-lay Barred Plymouth Rock pullets laid 3,514 eggs, as compared with 2,482 laid by exhibition pullets. The latter ate more feed but were larger birds. Data on economic egg production of 341 fowls for 11 months are summarized in the following table:

Egg record of hens and pullets from October 1, 1910, to September 1, 1911.

Breed.	Males.	Females.	Eggs laid.	Cost.	Average eggs per hen.	Grain consumed.	Milk consumed.
						Lbs.	*Lbs.*
Yearling Barred Rocks	2	55	5,961	$73.04	108.38	4,357.0	4,787.0
Barred Rock pullets	4	92	11,928	121.32	129.65	2,042.5	9,195.0
Buff Orpington pullets	5	60	6,401	69.45	106.68	4,805.0	4,597.0
White Leghorn pullets	6	111	13,504	116.32	121.65	6,739.0	8,704.0
Minorca hens and pullets	2	23	1,726	31.76	75.04	1,874.0	2,117.5
	19	341	39,520	411.89	115.83	24,817.5	29,400.5

The following table summarizes the effects of different animal feeds in a mixed ration upon egg production. Each lot consisted of 25 females and 2 males.

Feeding tests with Buff Orpingtons from October 1, 1909, to April 30, 1910, and with Rhode Island Reds from October 1, 1910, to May 31, 1911.

Kind of animal feed.	Buff Orpingtons.					Rhode Island Reds.				
	Animal feed.	Cost of total ration.	Eggs laid.	Cost per dozen eggs.	Percentage of eggs hatched.	Animal feed.	Cost of total ration.	Eggs laid.	Cost per dozen eggs.	Percentage of eggs hatched.
	Lbs.			*Cents.*		*Lbs.*			*Cents.*	
Buttermilk	1,453.00	$18.16	2,040	10.68	55.00	1,760.50	$25.60	1,762	17.43	57.00
10 per cent dry mash beef scrap	34.00	19.85	1,670	14.28	50.50	61.50	23.06	1,320	20.96	56.40
Beef scrap in hopper	141.00	22.21	1,664	15.84	33.00	106.00	23.92	1,625	17.66	51.60
Green cut bone	127.75	21.37	1,654	15.48	40.50	182.50	22.44	1,359	19.81	64.50
No animal food	.....	17.99	1,496	15.48	59.50	.....	17.70	730	29.09	66.25

The average cost of feed for 100 hens kept in an open house was 16.5 cts. per dozen. In a feeding test which involved 583 chickens, kept in colony houses on a ration of mixed grain and buttermilk, 3.3 lbs. of grain was required to produce 1 lb. of growth.

Essentials in profitable egg production, H. R. LEWIS (*New Jersey Stas. Bul. 244, pp. 5–36, pls. 10*).—A bulletin on practical poultry keeping, in which the chief factors concerned in the profitable production of eggs are discussed, and directions given for the hatching, brooding, and feeding of poultry, the marketing of eggs, and poultry house and appliance construction.

Increasing the egg supply on the farm, J. B. MORMAN (*Farm and Fireside, 35 (1912), No. 26, p. 4*).—The author gives the egg records of his flock of about

50 laying White Plymouth Rock hens for the 5 years 1907 to 1911, inclusive. By means of charts he indicates how, by the selection and breeding of early and good layers, he has increased the egg production of his flock from 3,966 eggs in 1907 to 5,573 eggs in 1911.

Increasing the winter yield of eggs, W. T. WITTMAN (*Penn. Dept. Agr. Bul. 219, 1912, pp. 91, pls. 20*).—This treats in a popular and practical way of the subjects of poultry breeding, management, incubation and brooding, feeds and feeding, houses and yards, and table eggs and egg yield.

The growth of ducks on four different kinds of feed, A. MAGNAN (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), Nos. 23, pp. 1535–1538; 25, pp. 1714–1717; 155 (1912), No. 2, pp. 182–184*).—Rouen ducks made a less rapid growth on a vegetable diet than on a diet of either flesh, fish, or insects. The greatest final weights were obtained on the flesh diet. Growth seemed to be arrested more quickly on the fish and insect than on the vegetable diet. Those fed vegetables laid fewer eggs, but the color of the yolk was of a deeper yellow than the eggs of the other lots. The liver and kidneys of the slaughtered lots were larger than where the feed consisted of fish and insects.

The turkey as an egg producer, W. N. IRWIN (*Amer. Breeders Mag., 3 (1912), No. 3, pp. 204–208, figs. 4*).—Attention is called to the value of the turkey as an economical producer of eggs, a feature of the poultry industry which has previously been overlooked.

Partridges and partridge manors, A. MAXWELL (*London, 1911, pp. XII+327, pls. 16, figs. 8*).—A popular work in which the partridge is treated as a valuable by-product of the English farm.

Fur farming for profit (*New York, 1912, pp. 188, figs. 50*).—"A practical text-book on breeding fur-bearing animals, either as a distinct industry or in connection with specialized or general farming."

Oyster culture studies in 1910, J. NELSON (*New Jersey Stas. Rpt. 1910, pp. 185–218, pls. 2*).—The spatting observations were continued in 1910 as in previous years, but the season was unusual in several respects. The fry in the water appeared and disappeared in a more erratic way than usual. There was a large amount of spawn in the oysters, but it was given out grudgingly though at frequent intervals, and the fry so prepared seemed to disappear without setting. Spatting did not take place before June 28 nor after July 7, and the climax occurred in the middle of the first week in July. At that time there was not a large amount of fry in the water. The nearer the shells were planted to the day of the spatting climax, the better the catch. Shells planted June 20 bore an average of 3 spat per shell, those planted June 26, 13, those planted July 1, 14, while those planted on the day of the climax bore more than twice as many. Therefore, even a few days' sojourn of the shells in water was sufficient to deteriorate the spat-catching qualities of the cultch.

The floating laboratory used in this work is illustrated and described. Experiments made in floating oysters are noted on page 762.

Concentrated feeding stuffs, C. S. CATHCART ET AL. (*New Jersey Stas. Bul. 243, pp. 3–62*).—This contains the results of feeding stuffs inspection in accordance with the state law and other data. Analyses are reported of cotton-seed meal, cotton-seed feed, linseed meal, ground flaxseed, flaxseed screenings, gluten feed, hominy meal, distillers' dried grains, meat meal, beef scraps, blood meal, malt sprouts, rye bran, rye middlings, ground rye, ground oats, crushed oats, oat hulls, brewers' dried grains, molasses feed, ground wheat, shredded wheat, wheat bran, wheat middlings, barley blowings, alfalfa meal, dried beet pulp, red dog flour, puffed rice screenings, corn meal, corn-and-cob meal, cob meal, buckwheat middlings, buckwheat bran, buckwheat offal, and proprietary mixed feeds.

Cattle feeds, R. HARCOURT (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 37 (1911), pp. 69–74*).—Analyses are reported of soy beans, cotton-seed meal, dried brewers' grains, shorts, middlings, a proprietary hog feed, linseed cake, pea meal, apple pomace, and silage.

The coming of dried beet pulp, D. J. WHITNEY (*Pacific Rural Press, 84 (1912), No. 3, pp. 49, 62, 63*).—Attention is called to the value of beet pulp as a feed for live stock, and particularly the dried pulp which is being produced in increasing quantity in this country.

Potato greens as stock food, W. DAWSON, Jr. (*Daily Cons. and Trade Rpts. [U. S.], 15 (1912), No. 218, p. 1392*).—According to a German authority, the consul general reports, potato tops are not harmful to animals as is commonly supposed. It is believed that the apparatus used for drying beets, potatoes, and other products can be used for drying the potato tops.

Hides and skins (*Chicago, 1912, pp. 15+247, pls. 11, figs. 14*).—This book gives instructions for handling hides of the larger domesticated animals, from the animal's back to the tannery door. It was written mainly for farmers and local butchers. It is stated that hides from Chicago packers bring higher prices than those of the same grade of animals from sources where the hide is not properly handled.

Regulations for animals on the German railways (*Zentbl. Preuss. Landw. Kammern, 2 (1912), No. 16, p. 111; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intell. and Plant Diseases, 3 (1912), No. 6, p. 1364*).—These regulations relate to the care and feeding of animals during transportation on German railways, which were to take effect May 1, 1912.

DAIRY FARMING—DAIRYING.

A study of the metabolism and physiological effects of certain phosphorus compounds with milch cows, II, A. R. ROSE (*New York State Sta. Tech. Bul. 20, pp. 3–32, figs. 4*).—The work reported in this bulletin was made in order to check the results of work previously noted (E. S. R., 18, p. 568), repeating the work in such a way as to eliminate more of the variable factors. This was effected by adjusting one of the animals used in the previous experiment to a low phosphorus ration, very nearly identical to the one formerly employed, and adding thereto the calcium salt of phytin. The technic of the work differed in no essential way from the previous experiment.

The results are summarized as follows:

"In this, as in the former experiments, the organic phosphorus ingested was eliminated very largely in the form of inorganic phosphorus by way of the intestine, the amounts of phosphorus in the urine being very small. When phytin was withdrawn from the ration, the decrease of phosphorus in the urine was immediate; when phytin was added, a rise in phosphorus occurred after a lag of 2 days. Phytin caused more phosphorus to be eliminated through the kidney than did whole wheat bran. The long duration of the low-phosphorus period did not in itself affect the phosphorus content of the urine nor the phosphorus balance.

"The insoluble phosphorus of the feces diminished with decreasing amounts of insoluble phosphorus in the rations, when the latter ranged above 14 gms.

"The soluble organic phosphorus disappeared very largely from the alimentary tract. The apparent utilization was poorer in the low-phosphorus periods and in the calcium phytate period than in the whole-bran period.

"For maintenance of phosphorus equilibrium in this species of animal the requirement would seem to be the amount of phosphorus eliminated in the milk plus 26 mg. per kilogram of body weight; an excess over this amount causes

phosphorus retention, and smaller quantities result in loss of phosphorus from the organism.

"The addition of calcium phytate increased the potassium both in the urine and dung, and changed the path of elimination of part of the magnesium from the kidney to the intestine. The calcium added as calcium phytate was almost entirely eliminated by the intestine immediately after administration. The calcium of the urine increased with decreasing phosphorus in the rations and decreased when calcium phytate was added.

"The nitrogen compounds of the ration were well utilized and for the most part a positive nitrogen balance was maintained. The animal gained 19 kg. during the experiment, half of which could be accounted for by the plus balance of nitrogen. There was a suggestion of a parallelism between the nitrogen and phosphorus balances.

"The former observations as to the influence of phosphorus compounds on the oestrum and the amount of urine voided were not corroborated; neither was the laxative effect previously noted. The difference in the moisture content of the feces of the several periods of this experiment was very small.

"A long low-phosphorus period resulted in unfavorable symptoms. The animal returned to a normal condition after a week's feeding on ash-rich rations including alfalfa, silage and wheat bran.

"The volume of the milk fluctuated inversely with the amount of phytin phosphorus in the rations. The increase of milk flow on removal of phytin was not a mere dilution. Except for the change in the amount of fat, the composition of the milk was not materially altered. The responses of the fat to the fluctuations of phytin phosphorus were immediate and consistent, as distinct, though not quite as large, as in the previous experiments. The best milk flow, both as to amount and fat content, happened to occur in the period of phosphorus equilibrium."

[Report of] the professor of animal husbandry, G. E. Day (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 37 (1911), pp. 141–149*).—The records of the dairy herd are given and several feeding tests are reported.

When dried brewers' grains were substituted for bran the milk production was increased in 9 out of 11 cows. Cotton-seed meal appeared to be equal to twice its weight of bran. Soy-bean meal gave results almost identical with those from cotton-seed meal. The normal milk yield was retained when a good quality of alfalfa hay replaced the grain ration.

The dairy herd, F. C. Minkler (*New Jersey Stas. Rpt. 1910, pp. 58–67, pls. 7*).—This gives the individual milk records, and an account of the methods of feeding the college herd. Thirty-one cows gave an average annual yield of 8,661 lbs. of milk with a fat content of 3.96 per cent. The following table gives some of the results obtained with the cows of different breeds kept in the college herd:

Comparison of the milk yields and income from dairy cows.

Breed.	Number of cows.	Average yield of milk.	Average fat test.	Average yield of milk fat.	Average yield of milk per day (for entire year).	Average number of days in milk.	Value of milk at 6 cts. per quart.
		Lbs.	*Per cent.*	*Lbs.*	*Lbs.*		
Holstein	16	9,724.2	3.43	333.91	26.6	284	$271.88
Jersey	7	7,978.0	5.17	411.84	21.9	293	223.06
Guernsey	4	5,822.0	4.85	282.42	15.9	212	162.78
Ayrshire	4	8,630.3	3.72	34.43	23.6	270	241.30

[Report of] the professor of dairy husbandry, H. H. Dean (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 37 (1911), pp. 89–140*).—The value of boric acid, borax, and sodium benzoate were tested as preservatives for Camembert and cream cheese, but they were found unsatisfactory, even aside from the question of healthfulness.

Studies of the effect of keeping soft cheeses at different temperatures gave the following results: "The Camembert cheese kept in the house refrigerator were unsaleable in about a week or 10 days, while the cream cheese remained good for 10 to 12 days under similar conditions. In the ice-cold storage all the cheese kept in first-class condition for about 2 weeks, but they tended to become moldy and go off in flavor after 2 weeks. Where the cheese were placed in mechanical storage at a temperature of 3° below freezing point, the cheese kept well for 3 weeks and were in fairly good condition at the end of nearly a month. Those cheese kept at ordinary room temperature began to go off in flavor and become moldy in about 5 days."

An unsuccessful attempt was made to ripen Camembert cheese, but a Pont L'Eveque cheese was ripened with good results.

In coloring cheese the best results were obtained by using 20 cc. of cheese annatto coloring per 100 lbs. of cream for cream cheese, and 10 cc. per 100 lbs. of mixed milk and cream for the Gervais cheese. Analyses of Gervais, Camembert, and cream cheese are reported.

In experimental work in making Devonshire cream a product of good quality was produced, either by separating the milk with a cream separator at temperature of from 170 to 180° F., or by separating at about 100° and afterwards heating the cream at a higher temperature. It may then be bottled while hot, covered, and set in a refrigerator to cool. Such cream should test from 50 to 60 per cent fat, and should keep in good condition for a week or 10 days. There was found to be less loss of fat than in the ordinary method of setting.

A number of tests were made to compare single-service paper bottles with glass bottles. The milk was pasteurized, then cooled to about 58°, and placed in the various packages and allowed to stand in a room where the temperature averaged 56° F. There was very little difference in the milk in the various containers as to temperature or acidity, but some of the paper packages imparted a package flavor to the milk after standing in them for about 24 hours. One or 2 of the monoservice paper bottles compared favorably with milk in the glass bottles. "If these packages can be put on the market in Canada at a reasonable price, we see no reason why they may not displace the ordinary glass bottle as a container for retail milk and cream."

As a result of experiments in weighing *vs.* measuring cream samples for Babcock test, the use of a sensitive balance is advised, but where none of the cream tests over 25 to 30 per cent no serious error should result by using an 18 cc. pipette, if care be taken to rinse all the cream from the pipette into the test bottle. No appreciable difference was found in the reading of 3 types of cream scales. In comparing the weights of cream and percentage of fat, no difference was found between the first and the twelfth bottle on the 12-bottle scale.

Numerous tests were made in sampling and testing cream. A sample of cream kept one month in tightly stoppered bottles averaged practically the same percentage of fat whether kept at low temperature or moderately warm temperature. There did not seem to be any advantage in the aliquot method over the uniform sampling for composite testing of cream. After testing numerous preservatives, it was found that the one used at the station for a number of years was as good as any, namely, 3 parts of bichromate of potash and 1 part of corrosive sublimate. The total difference in pounds of fat

credited to 3 creamery patrons' deliveries for the season was 5.195 less on weekly composite tests, as compared with daily tests; 16.602 lbs. less by the semimonthly; and 12.205 lbs. less by the monthly composite test. All of these are considered to be within the limits of error.

There was no difference in temperature and acidity of cream whether kept in a well-glazed crock or in one that was chipped and cracked, but cream kept in the crock in every case had a bad aroma after from 44 to 52 hours. There was but little difference whether or not the cream was cooled before placing in a can or crock, or whether covered or uncovered, in a reasonably clean, cool cellar, although it is stated that further tests are needed. There was but little difference between a covered and open can as against the covered and open crock for holding cream in the cellar. The weight of evidence appeared to favor not covering the cream can or crock provided that the cellar air is pure and free from undesirable odors. In collecting cream in an ordinary milk can and in a wooden-jacketed can, the cream in the latter arrived at an average of 3.4° cooler than did the cream in the milk can, and with slightly less acidity.

The cost of pasteurizing cream for butter making was found to be a trifle over 3 cts. per 100 lbs. of butter. Powdered milk was found to be satisfactory in the preparation of cultures for ripening cream for butter making. Sodium carbonate, sodium bicarbonate, and lime were used as neutralizers for lowering the percentage of acidity in cream, and all produced a marked effect. Pasteurizing further reduced the acidity. "In all cases, except the one where washing soda was used, the cream churned in less time after partial neutralization of the acid before pasteurizing. To some extent this may have been due to less weight of cream in the churn for these lots. There was also a tendency for less loss of fat in the buttermilk from these lots, as compared with the normal lots. There was a little difference in the percentage of moisture and salt in the finished butter from the various lots. The 'overrun' was less in the lots where the cream was neutralized, as compared with the 'overrun' from similar lots not neutralized. In the 4 tests which are comparable, the average 'overrun' in the normal lots was 16.9 per cent, while the others averaged 13.2 per cent. The tendency was for a lower yield of butter in the lots where the cream was neutralized before pasteurizing. There was little or no difference in the average scores for flavor, or in the total scores of the 4 lots. The results by neutralizing with limewater before and after pasteurization of the cream were not decisive. More experiments on all these points are needed before drawing conclusions."

Experiments in pasteurizing resulted as follows: "The pasteurized cream churned at the same temperature, in less time, in all of the comparative tests with raw cream, except at 175° F., where the average time for churning was the same for the pasteurized and raw lots. There was not much difference in the percentage of fat in the buttermilks from the various lots, what difference there was being in favor of the raw cream lots. The percentage of overrun was slightly in favor of the unpasteurized lots. There was not much difference in the quality of the butter except in the lots heated at 175° F., which scored an average of nearly one point higher as compared with lots made from similar cream churned raw."

Various preservatives other than salt, used in butter making, were found to contain from 15 to 38 per cent of sodium chlorid. Butter churned to the size of wheat and corn granules contained more moisture and less salt than similar butters churned to the size of apples. Salt applied in wet form (2 lbs. of water to 5 lbs. of salt) caused a higher percentage of both moisture and salt to be retained in the finished butter.

The casein and cheese investigations were continued along the lines of previous years. The Holsteins produced the most milk, milk fat, and casein; the Ayrshires were second in the amount of milk and casein; and the Jerseys second in the amount of milk fat. The Jersey milk contained the highest percentages of fat and casein. "The single tests of casein in patrons' milk at 10 factories varied from 1.84 to 2.67 per cent. . . . The percentage of fat in the milk at western Ontario factories averaged 3.42, and for eastern Ontario 3.44. . . . The composite sampling for casein was not satisfactory—the tendency being for tests at too high, using the Hart casein tester. Milk ought to be tested at cheese factories, and be paid for on the fat-casein basis. In the meantime 'fat+2' is near enough for all practical purposes, and represents fairly close the available casein and fat in milk for cheese making."

Seasonal tests of fat in casein are also given. "The milks with the higher percentages of casein and fat, produced an average of 6.4 lbs. more cheese per 1,000 lbs. milk, as compared with the lots having lower casein and fat. (Last year it was 4.64.) The yields of cheese per pound of fat and casein were 1.59 lbs. from the lots with low casein and fat, and 1.571 lbs. from the higher casein and fat content milks." This difference is not sufficient to cause any great error by using the fat-casein method as a basis of payment. The cheese made from the higher fat-casein content milks contained 0.39 per cent more fat but there was little difference in the moisture content.

Curds from eastern Ontario averaged 2.249 per cent more moisture at the time of dipping, 0.574 higher in the green cheese, and practically the same in the cheese 1 month old than did the samples from western Ontario. The cheese lost more moisture when ripened in an ordinary room, at a temperature between 60 and 75° F., than in a room with a fairly uniform temperature of 40°. Most of the loss in moisture in ripening occurred in the rind, or the first quarter of an inch on the surface of the cheese, and during the first week of ripening.

As in the work of previous years there was a decided loss in making Cheddar cheese from overripe milk. In testing the effect of acidity, the yield of cheese was less with a high percentage of acidity in the milk at the time of adding the rennet, but the cheese was of a slightly poorer quality. The result of 2 years' work emphasizes the need of dipping with less than 0.2 per cent of acid. The tests with stirring confirmed the conclusion of the previous year, in that slightly stirring caused about one point higher scoring than where curds were not stirred, and about three-fourths point lower average scoring than with those from curds stirred "dry."

Eleven experiments comparing the effects of salting on the basis of weight of milk with salting based on weight of curd showed but little difference. It is advised that from 2¼ to 2½ lbs. of salt per 100 lbs. of curd be used rather than from 2 to 2¼ lbs., the heaviest salting producing the better flavor. One per cent shrinkage can be saved by placing the cheese within a week in a room at 40° to ripen, as compared with 60 to 75°.

VETERINARY MEDICINE.

The animal parasites of domestic and useful animals, J. Fiebiger (*Die tierischen Parasiten der Haus- und Nutztiere. Vienna and Leipsic, 1912, pp. XVI+424, pl. 1, figs. 302*).—This is a text and handbook intended for use by students and veterinarians. The subject is dealt with in a systematic way under the main headings Protozoa, Vermes, and Arthropoda. Systematic lists of (1) the parasites and their hosts, (2) hosts and their parasites, with the part of the body infested, and (3) of such parasites that also attack man, are appended.

Researches on the spirochetes and related organisms, C. Dobell (*Arch Protistenk., 26 (1912), No. 2, pp. 117–240, pls. 5, figs. 3*).—"From a comparative study of the spirochetes, bacteria, and Cyanophyceæ, I have reached the following conclusions: The spirochetes may be collected into a single group, which may be called the Spirochætoidea. The Spirochætoidea are noncellular organisms (Protista). They undoubtedly belong to the Schizophyta (bacteria+Cyanophyceæ), and not to the Protozoa. Among the Schizophyta, they must be placed in the subdivision bacteria and among the bacteria they probably constitute a group of the same systematic status as the cocci, the bacilli, or the Spirilla. The spirochetes differ from the other bacteria in only one feature—though actively motile, they possess no specialized organs of locomotion. Every other character which they possess is represented in other forms of bacteria.

"The group Spirochætoidea comprises 4 different sets of organisms, which may be classified in the 4 genera Spirochæta, Treponema, Cristispira, Saprospira."

A bibliography is appended.

The separation of protozoan species by means of immunity, A. F. Coca (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 12 (1912), No. 2, pp. 127–133; abs. in Zentbl. Biochem. u. Biophys., 12 (1912), No. 23, pp. 938, 939*).—The results show that the various members of the same group (amœba) can be differentiated with the specific agglutination and complement fixation reactions.

The nature of trachoma bodies, S. B. Wolbach and S. H. McKee (*Jour. Med. Research, 24 (1911), No. 2, pp. 259–264, pls. 3*).—The authors find that trachoma bodies, the discovery of which resulted in the introduction of the new term "Chlamydozoa" for a possibly new group of intracellular protozoa, including the bodies found in variola, vaccinia, scarlet fever, contagious epithelioma of fowls, molluscum contagiosum, rabies, and other diseases of animals, are not specific, nor are they parasitic in nature. "We have come to the conclusion that trachoma bodies are the product of mucus secretion under pathological conditions."

The filterable viruses, a summary, S. B. Wolbach (*Jour. Med. Research, 27 (1912), No. 1, pp. 1–25*).—This is a summarized account in which the author discusses 30 diseases produced by filterable viruses. (See also E. S. R., 27, p. 181.)

In regard to the action of the barium ions upon the heart, N. Werschinin (*Arch. Expt. Path. u. Pharmakol., 66 (1911), No. 3, pp. 191–204; abs. in Chem. Ztg., 36 (1912), No. 15, Repert., p. 73*).—Like the substances contained in digitalis the barium ions inhibit systole and diastole. The difference, however, is only a qualitative one and is explained by the slight capacity which the barium ions have for penetrating (from without inward) the walls of a frog's heart. Barium ions can be easily removed from the heart by washing.

Researches on the poisons produced by Aspergillus fumigatus, E. Bodin and C. Lenormand (*Ann. Inst. Pasteur, 26 (1912), No. 5, pp. 371–380*).—In continuing investigations with *A. fumigatus* (E. S. R., 18, p. 88), the authors find that instead of a single toxin at least 2 are produced by this fungus. One acts as a convulsivant and is soluble in ether, the other is a depressant, insoluble or slightly soluble in ether and volatile.

Mortality of stock on mangels, C. Aston (*Jour. New Zeal. Dept. Agr., 3 (1912), No. 3, pp. 214, 215; Vet. Jour., 68 (1912), No. 445, pp. 425–427*).—The author reports briefly on investigations conducted following the loss in August of cattle and pigs which had been fed on mangels. Analyses of these mangels made during September showed the juice to contain 0.06 per cent of nitrogen as nitrites and nitrates. Nitrites were present in traces, a fact which seems

not to have been recorded before in mangels, although mentioned as being found in other plant juices in small amounts. "The amount of nitrogen found is equivalent to 0.43 per cent of potassium nitrate, and a cow eating 60 lbs. of mangel juice would consume 116 gm. (4 oz.) potassium nitrate (mangels contain 95 per cent of juice)."

Catalase and reductase tests in dairy inspection, L. A. KLEIN (*Cornell Vet., 2 (1912), No. 1, pp. 6–20, fig. 1*).—A description and a discussion of the advantages to be derived from the use of these tests in dairy practice. A review of the literature is also given.

Report of proceedings under the diseases of animal acts for the year 1911, T. P. GILL (*Dept. Agr. and Tech. Instr. Ireland, Rpt. Diseases Anim., 1911, pp. 69, pls. 3*).—This includes a special report on hog cholera and other diseases of animals in Ireland in 1911, by M. Hedley; and a special report on the transit of animals, by D. S. Prentice. Statistical data are presented in appendixes.

Annual report on the civil veterinary department, United Provinces, for the year ending March 31, 1912, E. W. OLIVER (*Ann. Rpt. Civ. Vet. Dept. United Prov., 1912, pp. II+23*).—This annual report includes accounts of the occurrence of contagious diseases of animals, breeding operations, etc. Statistical data are appended.

Toxin formation by the anthrax bacillus, A. MARXER (*Ztschr. Immunitätsf. u. Expt. Ther., I. Orig., 13 (1912), No. 4, pp. 309–328*).—Asporogenic anthrax bacilli produce a heat-stable endotoxin in large amounts. Spore-forming varieties yield the toxin only in small amounts. By injecting this toxin into animals symptoms are produced which simulate those produced by Friedberger's anaphylatoxin or from an extract of the typhoid bacillus (Aronson's extract). The urine from the animals treated with the endotoxin (and presenting the symptoms of shock) when injected into other subjects produced typical anaphylaxis. Like the endotoxins of some other bacteria the treatment of animals with the endotoxin produces no antitoxin in the blood.

Ascoli's reaction for diagnosing anthrax, F. DE GASPERI (*Rev. Gén. Méd. Vet., 18 (1911), No. 214, pp. 553–562*).—Attempts to obtain the reaction with the spleens and similar material from animals affected with pseudo-anthrax and specific anthrax serum resulted negatively.

The detection of anthrax with the precipitin reaction, W. PFEILER (*Berlin. Tierärztl. Wchnschr., 28 (1912), Nos. 9, pp. 149–151; 10, pp. 167–169*).—A critical exposition of the precipitin reaction as applied to the detection of anthrax.

Diagnosis of anthrax with the aid of the bone marrow, F. WULFF (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 24, pp. 421–423*).—The bone marrow taken from either the diaphysis or epiphysis can be used for detecting the presence of the anthrax bacillus for the purpose of diagnosing the disease. The method proposed gave positive results in instances where the blood or spleen was negative.

In regard to the so-called immunization of anthrax bacillus according to Danysz, W. LÉNÁRD (*Centbl. Bakt. [etc.], 1. Abt., Orig., 60 (1911), No. 6, pp. 527–531*).—Anthrax bacilli (Pasteur vaccine), cultivated in arsenic bouillon or rat serum, when subsequently grown on agar appear as a slimy culture containing encapsulated bacilli. The reason for this, in the author's opinion, is that the vaccine originally contains organisms which are capable of forming capsules about themselves. According to this an immunization as expressed by Danysz (E. S. R., 13, p. 92) can not be achieved.

Normal virulent anthrax bacilli, when grown according to the above mentioned methods, show no morphological changes.

Bacillus bronchisepticus (Bronchicanis); The cause of distemper in dogs and a similar disease in other animals, N. S. FERRY (*Vet. Jour., 68 (1912), No. 445, pp. 376–391, table 1*).—This is a general account of the disease in which the author summarizes the present status of our knowledge concerning it, together with a report of investigations conducted in continuance of those previously noted (E. S. R., 25, p. 787).

The infectivity of parts of organs of glandered horses, the complement fixation reaction with guinea pigs, and some curative and immunizing tests, H. MIESSNER (*Centbl. Bakt. [etc.], 1. Abt., Orig., 64 (1912), Festschrift F. Loeffler, pp. 121–151, pl. 1*).—Only one-quarter of the guinea pigs infected with pieces of the organs of glandered horses became glandered. According to this, the results obtained with the infection test must be interpreted with care. Guinea pigs infected with defibrinated blood rarely took the disease. Guinea pigs infected with either the organs or blood of glandered animals can only be considered glandered when the findings of the complement fixation test have been confirmed by the autopsical findings or the animals have gone through the course of a light form of the disease during their lifetime. Therefore the complement fixation reaction, when used for diagnosing glanders in guinea pigs, i. e., infection tests, can not be relied upon.

Guinea pigs were treated with mallein or a killed culture of the glanders bacillus for the purpose of determining whether the serum of these animals behaves as does that obtained from horses pretreated in the same way. This was answered in the affirmative with the aid of the complement fixation test. Artificial and natural gastric juice did not seem to have any particular bactericidal action for the glanders bacillus. Glanders bacilli placed directly in the stomach of guinea pigs produced glanders in these animals. Horses which were fed cultures of *Bacillus mallei*, given with the food, did not contract the disease. Immunizing tests with antiformin solutions of the glanders bacillus and guinea pigs showed that a single or a double treatment (given subcutaneously or intra-abdominally) did not produce an immunity in these animals. The salvarsan treatment was not effective for glanders.

The mallein test and its "vagaries," H. G. SIMPSON (*Vet. Rec., 24 (1912), No. 1226, pp. 417–430*).—In this article are discussed the relation between local and thermal reactions and the number and age of lesions found on post mortem, irregularities of the local manifestation, deferred and double local reaction, "lungers," and the results of a large number of tests and autopsies conducted by the author.

Leishmaniasis and babesiasis in Yucatan, H. SEIDELIN (*Ann. Trop. Med. and Par., 6 (1912), No. 2, pp. 295–300, fig. 1*).—The author states that a cattle importer has estimated that the loss of imported cattle due to splenetic fever (piroplasmosis) would reach as high as $70,000 within a period of 3 months. Native cattle are said to suffer from the disease in a mild form. A chronic case of canine piroplasmosis is reported to have been observed.

The hemolytic action of mastitis milk, F. MOSER (*Centbl. Bakt. [etc.], 1. Abt., Orig., 65 (1912), No. 4–5, pp. 269–296*).—The milk from animals affected with mastitis as a rule contains complement, the amount, however, being subject to a great many variations and dependent to quite an extent upon the degree of inflammation. Milk which has a normal appearance contains little or no complement. Hemolytic amboceptor was not noted. The hemolytic method is considered of no value for practical purposes because simpler methods are at our disposal.

The pathological anatomy of natural and experimental murrina—a trypanosomal disease of the Isthmus of Panama, S. T. DARLING (*Jour. Med. Research, 26 (1912), No. 2, pp. 219–247, pls. 2*).—In this paper the author reports

studies of the pathological changes elicited in a variety of animals naturally and experimentally infected with *Trypanosoma hippicum*, namely, native horses, American mules and work horses, dogs, raccoons, monkeys, *Cebus hypoleucus*, *Nyctipithecus* sp., rabbits, guinea pigs, rats, mice, and coati.

Trypanosomes infecting game and domestic stock in the Luangwa Valley, northeastern Rhodesia, A. KINGHORN and W. YORKE (*Ann. Trop. Med. and Par., 6 (1912), No. 3, pp. 301–315*).—"Trypanosomes are of frequent occurrence in game and domestic stock in the Luangwa Valley. At least 37.5 per cent of the buck harbor parasites. Six species of trypanosomes were found, viz, *Trypanosoma rhodesiense*, *T. vivax*, *T. nanum*, *T. pecorum*, and 2 others, of which one was possibly *T. montgomeryi*.

"*Glossina morsitans* in nature transmits 2 of these trypanosomes, viz, *T. rhodesiense* and *T. pecorum*, and probably also transmits at least 2 others, viz, *T. vivax* and *T. nanum*. Circumstantial evidence exists to show that *T. pecorum* may be transmitted by biting insects other than tsetse flies."

Serological methods for diagnosing trypanosome diseases, F. RUPPERT (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 22, pp. 381–383*).—This is a study and description of serological methods for diagnosing dourine and nagana with the aid of agglutination, precipitin, the Porges-Meier reactions, and the complement fixation method. Good results were obtained with the first 3 methods, but the tests with the complement fixation method were not conducted under ideal conditions.

The relation of animal fat to tubercle bacillus fat, W. C. WHITE and A. M. GAMMON (*Jour. Med. Research, 26 (1912), No. 2, pp. 257–266*).—In this paper the results of a preliminary study of the behavior of various animal and vegetable fats, viz, stearic acid, oleic acid, palmitic acid, linolic and linoleic acid, and butter and human fat with tubercle bacilli growing on glycerin agar, are reported. Olive oil was used as a source for the oleic acid, palm oil for the palmitic acid, linseed oil for linolic and linoleic acids, and beef suet for the stearic acid. On the basis of the results obtained the authors suggest an explanation for the caudal lobe lesions in cattle and the apical lesions in tuberculosis of man, as follows:

The pulmonary artery, before dividing into the right and left pulmonary branches, forms a great bay of blood bounded by a very elastic vessel wall. The blood in this portion of the pulmonary artery must move with comparative slowness, because of the short circuit which it makes in comparison with the long circuit made by the general aortic quota of blood. In this great bay the blood is loaded with fatty derivatives of low specific gravity compared with the whole blood. Owing to the slowness of the current, these compounds have a chance to rise to the surface of the stream, so that the upper layer of blood in the pulmonary artery should have a much larger content of fatty compounds than the lower one. At the highest point of this main blood stream in man the vessel arises that supplies the apex of the upper lobe on either side, so that if the theory advanced be correct, this vessel should be the vessel most laden with the fatty compounds of low specific gravity which are being poured into the pulmonary stream by the liver mechanism. "This view, coupled with the results of our experimental work so far completed, which shows that the tubercle bacillus makes use of these compounds for its more abundant growth, seems a most reasonable explanation of its more prevalent development in the apex of the upper lobe."

The relations between the human and the bovine type of tubercle bacillus, G. S. WOODHEAD (*Lancet [London], 1912, I, No. 22, pp. 1451–1457*).—This is an address delivered at the International Conference of Tuberculosis, held at

Rome in April, 1912. It deals principally with the findings of the British Royal Commission on Tuberculosis (E. S. R., 26, p. 884).

Human and bovine tuberculosis, H. VALLÉE (*Rec. Vét. [Toulouse], 37 (1912), No. 6, pp. 350, 351*).—The author believes that the disease is transmissible from animal (bovine) to man, particularly to infants. The majority of cases in man, however, are deemed due to transmission from man to man.

The relative importance of the human and bovine type of tubercle bacilli for the production of tuberculosis in man, A. CALMETTE (*Rev. Hyg. et Pol. Sanit., 34 (1912), No. 4, pp. 349–357*).—Repeated contact or infection with large doses of the bovine type of bacillus will produce tuberculosis in man, especially in young children. The greatest source of danger lies in the communication of the disease from man to man. This is shown by the occurrence of pulmonary tuberculosis in countries where no tuberculous cows are present and where no cow's milk is fed to the young.

The complement fixation reaction in tuberculosis, C. HAMMER (*München. Med. Wchnschr., 59 (1912), No. 32, pp. 1750–1752; abs. in Centbl. Bakt. [etc.], 1. Abt., Ref., 54 (1912), Beiheft, p. 201*).—Forty-three out of 46 cases of the disease in man were diagnosed by this method. Of the cases recorded 35 were pulmonary, 7 surgical, 1 glandular, and 3 lupus. In addition to this the test gave positive results in 20 out of 26 cases of suspected tuberculosis in bovines. On autopsy 19 out of the 20 reacting animals showed the lesions of tuberculosis. Some of the lesions were very slight.

The sero diagnosis of bovine tuberculosis, HAMMER (*Deut. Tierärztl. Wchnschr., 20 (1912), No. 39, pp. 593–596*).—This is a continuation of the work reported in the abstract above and gives in detail the technic used in the experiments and some additional results obtained with 96 bovines.

Of these 96 animals 48 were found to be tuberculous upon slaughter and 48 free from the disease. The complement fixation test with the same lot of animals showed 50 to be tubercular and 46 healthy. The antigen employed was made from a tuberculous peritoneal nodule and old tuberculin.

The cooperative dairy industries in Germany and stamping out tuberculosis according to the new national epizootic law (*Molk. Ztg. Berlin, 22 (1912), No. 25, pp. 290, 291*).—This is a discussion of this law as it applies to the cooperative dairies of Germany. The methods for treating the milk obtained from infected animals, results of the clinical examination of the animals, and notes on their elimination from the herds are also included.

The lymphatic system of the bovine, H. BAUM (*Das Lymphgefässsystem des Rindes. Berlin, 1912, pp. XII+170, pls. 32*).—This work consists of 4 parts. The first or general part (pp. 1–10) deals with technique, terminology, etc.; part 2 (pp. 11–53) with the lymph-nodes; and part 3 (pp. 54–162) with the lymphatic vessels. In part 4 (pp. 163–165) the lymph-nodes and lymphatic vessels of the different parts and regions of the body are brought together. The work is illustrated by colored plates and a bibliography of 60 titles is appended.

The nature of the marginal points occurring in the blood corpuscles of cattle, M. KOIDZUMI (*Centbl. Bakt. [etc.], 1. Abt., Orig., 65 (1912), No. 4–5, pp. 337–340, pl. 1*).—Studies of blood smears taken from cattle in the southern part of Formosa, where an endemic disease closely allied to Texas fever is found, have led the author to conclude that it is due to *Babesia (Piroplasma) bigemina*. The marginal points are thought by him to represent a stage of Babesia, since they remain for a long time in the blood corpuscles of recovered cattle and serve as a source of infection to new comers.

"When cattle are on the way to recovery the marginal points as described by Smith and Kilborne make their appearance in addition to the large forms. For sometime afterwards, both large forms and small bodies are found in vari-

ous proportions. As the animal continues recovering its health, the former become gradually reduced in number until finally the latter only comes to be found in blood. . . . While studying blood smears of cattle in which both the normal forms and the marginal points are found together, I could find several intermediate forms between these 2 and the course of formation of the former from the latter."

The author states that he can not accept the view that all of the marginal points, or coccus-like bodies, are no other than *Anaplasma marginale*. "I can not but believe that *Babesia bigemina* at least, takes a form of the marginal points in its life cycle as believed by Smith and Kilborne, Knuth, Ollwig, and Manteufel. . . . I also had opportunities of examining such forms in blood of calves, mice, and rats. And it was found that they are clearly distinguished from the marginal points appearing in the life cycle of *B. bigemina*."

Some notes and suggestions in connection with the etiology of bovine onchocerciasis, J. B. CLELAND (*Jour. Trop. Med. and Hyg.* [*London*], *15* (*1912*), *No. 15, pp. 232–235*).—A further discussion of the etiology of this disease (E. S. R., 25, p. 887).

It appears most likely that *Stomoxys calcitrans* is the insect host concerned in the transmission of the embryo of this parasite from host to host. Since embryos from the worm nests are occasionally liberated into the blood stream, this fly has an opportunity to imbibe one or more of the sparsely distributed embryos and, after a partial development, to inoculate a fresh vertebrate host therewith.

Streptotrichosis in a bullock in India, G. K. WALKER and R. BRANFORD (*Vet. Jour., 68* (*1912*), *No. 447, pp. 541–545, figs. 4*).—The author records a case of this disease in a bullock in the Punjab.

Notes on the muscular changes brought about by intermuscular injection of calves with the virus of contagious pleuro-pneumonia, W. H. BOYNTON ([*Philippine*] *Bur. Agr. Bul. 20, 1912, pp. 10, pls. 4*).—"From all appearances the contagious pleuro-pneumonia virus seems to have a specific action upon muscle and connective tissue, affecting chiefly the connective tissue elements. The appearances suggest that the virus multiplies in the lymph spaces of the connective tissue and blood vessels, gradually working its way through the walls of the blood vessels, causing an inflammation of the intima and thus giving rise to thrombus formations. The virus having invaded the tissue gives rise to a serofibrinous exudate, intermingled with groups of leucocytes leading to thrombosis of both lymph and blood vessels.

"The muscle lesions correspond with the lung lesions of contagious pleuro-pneumonia in the following respects: Thrombus formation in the veins in both tissues; the inflammatory areas around the blood vessels are similar; the connective tissue is chiefly affected in both tissues; the abundant serofibrinous exudate is present in both; the deep staining line of leucocytes along the edge of the connective tissue is characteristic in both tissues; the tendency toward a chronic productive inflammation is present in both."

A study of the normal blood of the carabao, W. H. BOYNTON ([*Philippine*] *Bur. Agr. Bul. 21, 1912, pp. 12*).—Twenty-five animals in normal condition, from 2½ to 6 years of age, were used in the studies here reported.

"In the circulating blood of supposedly normal carabaos over 2 years old the red corpuscles were found to average 6,057,520 per cubic millimeter. The average percentage of hemoglobin was 92.6. The average number of leucocytes was 10,389 per cubic millimeter. The average specific gravity found was 1.0532. The relative volume of corpuscles to plasma was found to be 29.1 per cent of corpuscles to 70.9 per cent of plasma. The average time for complete coagulation of the blood was found to be 3 minutes and 16 seconds plus."

Of the 5 varieties of leucocytes found in the peripheral blood, 48.5 per cent were lymphocytes, 4.6 per cent large mononuclears, 34.5 per cent polynuclears, 11.5 per cent eosinophiles, and 12 per cent mast cells.

Contributions to the knowledge of the involution of the normal uterus of the goat, G. HAENISCH (*Beiträge zur Kenntnis der Involution des normalen Uterus der Ziege. Inaug. Diss., Univ. Leipsic, 1911, pp. 64, pls. 4*).—A report of studies of 32 individuals. A bibliography of 30 titles is appended.

Notes on the attenuation of virus in the blood of cholera hogs to prepare a vaccine, R. GRAHAM (*Amer. Vet. Rev., 41 (1912), No. 3, pp. 330–334*).—Tests were made for the purpose of determining the advisability of using hog-cholera vaccines heated to 60° C. for immunizing against this disease.

The results show that the inoculation of a virus attenuated at 60° for 1 hour does not produce a sufficient immunity to protect hogs against this disease. It also usually presents the additional danger of actually producing hog cholera, as was shown in the experiment. The temperature to which the liquid blood must be heated to produce a reliable vaccine is variable, and the same dose of vaccine may kill, protect, or nonprotect, upon inoculating animals of the same size under similar surroundings. Virus attenuated by heating to 60° when not carbolized will remain virulent for at least 24 days.

Vaccination against hog cholera, F. S. SCHOENLEBER (*Kansas Sta. Bul. 182, pp. 439–464*).—Of 292,400 hogs vaccinated with the serum produced at the Kansas College during 1911 reports were received in regard to 32,894 head, which had been given the serum treatment alone, the serum-simultaneous method, or the author's combination method, i. e., serum alone followed in 10 days by the serum-simultaneous method, with results as follows:

General summary of Kansas hog-cholera vaccinations.

Condition of herd.	Method.	Number of herds.	Number of vaccinations.	Number of deaths.	Number of recoveries.	Percentage of recoveries.
Diseased	Serum alone	235	16,543	5,031	11,506	69.55
Noninfected		145	9,350	24	9,326	99.73
Total		380	25,893	5,055	20,832	80.50
Diseased	Simultaneous	8	657	52	605	92.00
Noninfected		33	2,565	82	2,483	96.80
Total		41	3,222	134	3,088	95.50
Diseased	Double	14	909	388	521	57.30
Noninfected		18	2,870	24	2,876	99.17
Total		32	3,779	412	3,367	89.00
Diseased	All methods	257	18,109	5,471	12,632	69.80
Noninfected		196	14,785	130	14,655	99.10
Total		453	32,894	5,601	27,287	83.00

In addition to the above the bulletin discusses in a clear and concise way the 3 methods of vaccinating, the Kansas state law, immediate effects of vaccination, losses, care of hogs before and after vaccinating, instruments, the serum and its production, controlling the disease, when and when not to vaccinate, effect of vaccination on the offspring, stocking up after an outbreak, forms of the disease, conditions favoring the disease, conditions or diseases which resemble cholera, manner of infection, period of incubation, prevention of the disease, disinfection, post mortems, and a few precautions and hints.

Ascoli's thermoprecipitation reaction as a diagnostic aid for swine erysipelas, M. IWICKI (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 23, pp. 491,*

402).—This is a study of the Ascoli method as applied to the diagnosis of erysipelas in hogs. The organs used were the kidney and spleen. In some cases both were employed.

Although a few negative results were obtained with positive material, the author believes that the method can be used providing a specific serum of the proper strength is employed. Special emphasis is placed on the point that some additional work will have to be done in regard to preparing a more suitable serum for this purpose.

Infection with Bacillus aerogenes capsulatus, S. A. Deming (*Amer. Jour. Vet. Med., 7 (1912), No. 9, pp. 365, 366*).—The author reports observations of a case of this infection in the mule in Iowa.

The condition of the digestive tract in parathyroid tetany in cats and dogs, A. J. Carlson (*Amer. Jour. Physiol., 30 (1912), No. 4, pp. 309–340*).—"There are no spasms, contractures, or other evidence of hyperexcitability or tetany of the neuro-muscular mechanisms of the digestive tract in parathyroid tetany in cats and dogs. Even in very severe tetany the movements of the stomach and the intestines may be normal. The deviation from normal is in the direction of depression or paralysis."

Observations on fowl and ducks in Uganda with relation to Trypanosoma gallinarum and T. gambiense, H. L. Duke (*Proc. Roy. Soc. [London], Ser. B, 85 (1912), No. B 580, pp. 378–384, pl. 1*).—The author concludes that *T. gallinarum* can multiply in the gut of *Glossina palpalis*, although this fly is probably not the normal host. Muscovite ducks are not thought capable of acting as a reservoir for *T. gambiense*.

RURAL ENGINEERING.

The storage of water for irrigation purposes.—I, Earth-fill dams and hydraulic-fill dams. II, Timber dams and rock-fill dams, S. Fortier and F. L. Bixby (*U. S. Dept. Agr., Office Expt. Stas. Bul. 249, pts. 1, pp. 95, pls. 20, figs. 41; 2, pp. 64, pls. 8, figs. 38*).—Small and medium sized reservoirs are deemed as urgently needed to provide additional water supply for arid lands as are large reservoirs and to have a more extended use, especially in the late summer seasons if the stream flow is short and water is needed for stock and the more valuable crops such as alfalfa, potatoes, sugar beets, sugar cane, and orchards. In this bulletin the types of dams suitable to small reservoirs only are considered. Several different types of these dams and several specific structures with cost data are described, and a large amount of information is given relative to the proper location, construction, and lining of the reservoirs, the different methods of location and design, and the equipment, methods, and material of construction of these dams with spillways, gates, valves, conduits, and all operating machinery.

Tests indicate that in earthen dam construction it is advantageous to use a mixture of materials ranging from fine to coarse to effect as high a degree of compactness as possible, and that the foundation should be on firm and reasonably dry ground. In hydraulic-fill dam construction the features to be considered are a supply of water with a flow of from 2 to 20 cu. ft. per second under a pressure of from 40 to 75 lbs. per square inch; suitable material such as may be readily sluiced into place and will give the required degree of compactness, stability, and imperviousness; and available quantities of this material close enough by to make transportation by the hydraulic method practical. The timber dam is regarded as a suitable and economical structure in all the smaller and less expensive irrigation systems because of its cheapness in first

cost, ease and rapidity of construction, and its adaptability to a wide range of conditions and locations. In rock-fill dams the greater part of the structure consists of loose rock dumped into place and rendered impervious by the use of earth, lumber, concrete, or steel, the size of the dam and the ultimate cost of obtaining and placing the materials determining which is preferable in each case. The mass and weight of the rocks provide the necessary stability against water pressure and overturning and sliding tendencies.

Shallow pumping for irrigation in the West, W. L. WILDER (*Mid-Continent, 5 (1912), No. 7, pp. 14–17, figs. 7*).—This general discussion of shallow irrigation pumping in the West indicates that the best sources of cheap power on the farm at the present time are the gasoline engine and the electric motor. To these are considered due the success of shallow irrigation pumping. Several forms of pumps and water-lifting devices in present use are described.

Irrigation by pumping in western Kansas, F. D. COBURN (*Topeka, Kans., 1912, pp. 12, figs. 3*).—The author discusses the possibilities presented by irrigation pumping in western Kansas, describing several private pumping plants in use which give satisfaction and showing that whenever irrigation by pumping from deep bored or artesian wells may be done to supplement rainfall it will bring about great increases in crops.

A new method of subirrigation (*Texas Farm Co-operator, 35 (1912), No. 35, pp. 1, 2*).—A description is given of a subirrigation system in Texas in which the water is distributed by concrete pipe, the main pipe, 4 in. in diameter, running the length of a field and feeding 2-in. lateral pipes which are laid at intervals of 33 ft. At intervals of 3 ft. small holes are made in the tops of the lateral pipe in which are inserted small plugs with pin hole end openings. Concrete caps are placed over these plugs, leaving just enough space to allow the water coming through the plug to percolate from under the cap and into the soil. It is claimed that a well with a capacity of only 40 gal. per minute furnishes sufficient water to irrigate 20 acres, using a 4¼-in. working barrel pump driven by a 2-horsepower engine. The advantages presented by this system are the great savings of land and water.

Overhead irrigation in the citrus grove (*Pacific Rural Press, 84 (1912), No. 2, p. 28.*)—A system of overhead irrigation is described in which galvanized iron pipe lines are run underground through every alternate row of trees, and stand pipes 15 ft. high are raised through every fourth tree, the water being distributed through rotary sprinklers. The head pipe is 4 in. in diameter and is tapped by 17 rows of 1½ in. pipe, which reduces to 1¼ in. toward the center and to 1 in. along the lower third. The branch pipes to individual trees are ¾ in. and the stand pipes ⅜ in. The pumping is done by electricity and the cost of the system was about $150 per acre.

Super-elevation of water surface in passing around curves at high velocities (*Engin. and Contract., 38 (1912), No. 1, p. 24, figs. 2*).—A mathematical discussion is given providing for a raise in the outside walls of irrigation canal curves to prevent loss of water due to superelevation.

[Duty of water], W. W. MCLAUGHLIN (*Mid-Continent, 5 (1912), No. 5, pp. 25, 26, fig. 1*).—This is a general discussion of the meaning of the duty of water, presenting the opinion that this should be based entirely upon the economic productive power of the water, including net return on money invested, labor and equipment required, and the marketable qualities of the crop produced, rather than on the amount of water required to produce a certain quantity of crop, and thus distinguishing between primitive methods and modern scientific methods of irrigation.

Notes on irrigation in Cape Colony, J. MULLIE (*Bul. Agr. Congo Belge, 3 (1912), No. 2, pp. 257–290, pl. 1, figs. 25*).—A general discussion of the

geography and meteorology of Cape Colony is followed by notes on the cost of irrigation per acre, the value of irrigated lands, surface and subsurface waters, irrigation work, duty of water, and the general extent of irrigation in the colony.

[Practical problems in irrigation, drainage, and hydraulics on the farm], W. B. GREGORY (*Hacienda, 7 (1912), No. 10, pp. 291–299, figs. 20*).—This article deals with irrigation and drainage and general agricultural hydraulics, discussing the selection and installation of power machinery, pumps, etc., for irrigation pumping, the preparation of the soil for irrigation, the amount and frequency of irrigation, drainage of irrigated lands, drainage by hydraulic machinery, and the possibilities of converting hydraulic energy into electrical energy.

Canada's drainage problem, W. H. DAY (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 37 (1911), pp. 65, 66, fig. 1*).—It is stated in this report that in Ontario as a whole there are from 25,000,000 to 30,000,000 acres of land needing drainage, for much of which large outlets must be provided by the government. The increased crop returns for the entire Dominion following drainage are estimated at several billions of dollars per annum.

Plans for and estimates of costs of draining 33,000 acres of swamp land in North Carolina (*Engin. and Contract., 37 (1912), No. 20, pp. 565, 566, figs. 2*).—Ten different ditches are included in this work, designed to carry 1 in. run-off per 24 hours with side slopes of 1:1 and a minimum width of 14 ft. The cost of the entire work is estimated at $142,621, or about $4.32 per acre.

A good form of tiling contract, F. O. NELSON (*Successful Farming, 11 (1912), No. 8, p. 18*).—A form for contracts between landowner and tiling contractor to be used in all cases, thus eliminating the usual unsatisfactory verbal contract on small tile drainage jobs, is suggested.

[Experimental road work near Baltimore, Md.], W. W. CROSBY (*Good Roads, n. ser., 4 (1912), No. 10, pp. 93–99, figs. 7*).—This is a summary with tables of results and costs of experiments with the penetration method of bituminous road construction. The road is about 6⅓ miles long and varies from 14 to 24 ft. in width. The old macadam surface was scarified, reshaped, and the foundation strengthened where necessary. It was rolled and covered with a 4 in. layer of 1 to 2 in. crushed stone with a ½ in. per foot crown. This was rolled to the utmost possible compaction and hot pitch applied and evenly distributed. A thin coating of ¼ to 1 in. clean stone chips was placed on top to absorb the excess pitch and fill the extra voids, the quantities of pitch and stone chips varying greatly per square yard under different circumstances. Some sections of the work were made of ordinary water-bound macadam with a top coat of cold pitch and stone chips.

Where the quantity of pitch used was in excess of 1.7 gal. per square yard the bleeding of the pitch in hot weather and the slipperiness in cold weather were found particularly objectionable, especially where tars were used. On the whole, after from 2 to 3 years, the condition of most of the sections is deemed satisfactory, the cost being the only questionable feature.

Road building by convict labor in Colorado, T. J. TYNAN (*Threshermen's Rev., 21 (1912), No. 5, pp. 59, 60, 62*).—Attention is called to the use of convict labor in Colorado for road building, as being much cheaper than other labor. It is noted that 50 miles of rock road were constructed at a cost of $1,134 per mile, which by ordinary labor would have cost $25,000 per mile.

Concrete roads in the country, N. A. CLAPP (*Farmers' Rev., 44 (1912), No. 20, p. 532, figs. 3*).—Attention is called to the progress of concrete road construction in Wayne County, Mich., briefly reviewing methods of construction

and noting the commercial and social advancement of the community. The cost of these roads is about $16,000 per mile.

An act creating a state highway department and providing aid in construction and maintenance of highways (*Ohio Highway Dept. Bul. 14, 1911, pp. 19*).

[Reducing the cost of farm power], D. C. SHAFER (*Tribune Farmer [N. Y.], 11 (1912), No. 561, pp. 1, 2, 21, figs. 4*).—This article enumerates as the 3 reliable sources of farm power internal combustion engines, electricity, and water power, and discusses their use in connection with the heavy work ordinarily performed by men and horses. The fallacy of installing low voltage electric power systems is pointed out and methods of harnessing and transmitting small water power are outlined.

Electricity on the farm, P. A. BATES (*Nat. Land and Irrig. Jour., 6 (1912), No. 2, pp. 6–8, figs. 9*).—This article deals with the use of electricity for operating cream separators, churns, milking machines, and dairy refrigerators in small farm dairies and describes installations in present use.

The storage battery in isolated lighting plants, T. MILTON (*Gas Engine, 14 (1912), No. 7, pp. 353–356*).—Investigations of the storage battery when used in connection with isolated electric systems indicate that by the use of storage batteries, electric light and power may be had for 24 hours by operating the gas engine and dynamo a much shorter time.

The power windmill and electric lights on the farm, F. FORREST (*Wis. Farmer, 41 (1912), No. 30, p. 709, fig. 1*).—A description of a farm power plant driven by a windmill which operates several machines by belt and shaft drive and also an electric generator for electric light, the entire cost of the plant being about $250.

[Running and maintenance of the internal combustion engine] (*Gas Engine, 14 (1912), No. 9, pp. 482–485*).—Notes are given on the starting, running, and maintenance of internal combustion engines with directions for maintaining the following conditions on which the good working of the engines depend: Suitability and steady supply of fuel, correct fuel mixture, sufficient compression, correct valve and ignition timing, efficient governing, good water circulation in the jackets, good but not excessive lubrication, and general cleanliness.

Selection and care of gas traction engines and equipment, F. H. CROSSMAN (*Canad. Thresherman and Farmer, 17 (1912), No. 6, pp. 30, 32*).—The author recommends for private work a 15 to 30 horsepower, single cylinder, throttle governed, water-cooled, gas or kerosene engine, and for a general public plowing business a 30 to 60 horsepower, oil-cooled, gas or kerosene engine. He gives brief directions for the care and use of the engine and its equipment, and suggests a list of tools and other handy equipment.

[The gas engine governor], C. W. HULL (*Gas Engine, 14 (1912), No. 9, pp. 479, 480*).—Directions are given for the care of the governing mechanism on internal combustion engines, more especially on the hit-and-miss governed type. It is stated that the speed should be controlled with minimum variation from no load to full load and from full to no load in order to prevent injury to the engine due to sudden speed changes, to obtain the best results from the driven machinery, to give fuel economy, and to save the time wasted by hand regulation.

Some lubrication problems, A. E. POTTER (*Gas Engine, 14 (1912), No. 7, pp. 343–348*).—This is a paper read before the National Gas Engine Association at Milwaukee, in which the author discusses gas engine lubrication. He states that the simplest and easiest gas engine to lubricate efficiently is the horizontal 4-cycle engine, and maintains that every vertical gas engine piston

should have a ring at its lower extremity, in addition to the usual piston rings, to create a pressure to force oil accumulations to the wrist-pin bearings rather than to the combustion chamber. He points out the evils of the splash and flushing systems of lubrication and advocates the automatically regulated pressure pump system used in most foreign designs. He discusses the fire, cold, and viscosity tests of oils, and states that a high-fire test, fairly thin oil is best adapted to vertical engines using a positive force-feed lubrication system, while a low-fire test oil better answers the requirements where splash systems are employed, on account of allowing for a sure sufficiency for a less positive system in order that the excess oil may be more completely consumed in the combustion chamber.

Cooling the farm engine, J. H. BEATTIE (*Farm Machinery, 1912, No. 1072, pp. 15, 16*).—Attention is called to the importance of keeping the cylinder of a gasoline engine cool, and several farm engines are described which are cooled by air, water, or oil.

A gas locomobile, L. DUBOIS (*Jour. Agr. Prat., n. ser., 23 (1912), No. 21, pp. 654, 655, figs. 2*).—A description is given of a power and tractor outfit consisting of a combination of internal combustion engine and gas generating equipment. The engine is a 4-cycle, water cooled type manufactured in sizes of from 8 to 55 horsepower, and burns the gas direct from the attached generator.

Problem of the small tractor, L. W. ELLIS (*Farmer's Advocate, 47 (1912), No. 1032, pp. 960, 961, figs. 4*).—This is a paper read before the National Gas Engine Trades Association at Milwaukee.

The author discusses the small tractor problem confronting tractor designers and compares American with foreign design. The French designers have dealt most extensively with small, all-service tractors, and combinations of tractor engine with plowing and cultivating devices, with indifferent success, while the Americans have dealt almost exclusively with large tractors for heavy work. "Practically every idea submitted abroad has been the subject of original investigation and experiments in this country, and actual experience has shown the impracticability of many of what are superficially regarded as essentials of the small tractor."

Why a kerosene tractor, R. OLNEY (*Irrig. Age, 27 (1912), No. 10, pp. 372, 373, figs. 4*).—A discussion of the fuel question for internal combustion tractors, giving a comparison of the costs of using gasoline and kerosene in a special type. With this tractor plowing was done with gasoline for 72.6 cts. per acre and with kerosene for 58.6 cts. per acre.

Can tractor rating be standardized? (*Canad. Thresherman and Farmer, 17 (1912), No. 7, pp. 44b, 44c*).—A discussion of the problem of a standard system of rating for tractors. One opinion expressed is that since a tractor is required to operate under widely varying conditions of soil, roadway, and weather, a conservative brake horsepower rating of 20 per cent below the possibly developed brake horsepower should be adopted, while another opinion is that a standard method of testing could be adopted requiring the use of a pair of drums mounted on a shaft running on roller bearings and connected to a Prony brake. The tractor should be made to climb planks into such a position that the traction wheels would be in contact with and supported by the drums and held in this position by a draw-bar dynamometer connected to a post. By this apparatus and by scales under the front wheels and the draw-bar dynamometer, the load on the traction wheels when pulling and at rest, giving the axle torque and the horsepower delivered, including rolling friction of the tires, and readings in connection with the traction-wheel tire speed, can be obtained.

Motor plows and ground-breaking machinery, HOLLDACK (*Jahrb. Deut. Landw. Gesell., 27 (1912), No. 1, pp. 203–219, pls. 15, figs. 11*).—A discussion is

given of motor plows and ground breakers in general, describing some special improved types, including combinations of motor and high-speed rotating ground breakers and presenting a graphical discussion of the losses in the drive wheel by slipping and sinking and special improved types of drive-wheel rim to prevent this.

The application of motor plows, E. FREUND (*Wiener Landw. Ztg., 62 (1912), No. 45, pp. 543, 544*).—A description and discussion are given of three systems of motor plowing, namely, the rope and windlass system, the drag system, and the combination tractor and ground-breaker system, giving tables showing the horsepower, revolutions per minute, weight, fuel, required, cost of operation, and initial cost of the different makes of each system.

[A powerful ditching machine] (*La. Planter, 48 (1912), No. 19, p. 336, fig. 1*).—A powerful ditching engine is described which pulls a bull ditcher back and forth between the main canals of an irrigation system, thus making a system of connecting ditches between the main canals. It is claimed that the ditcher can be operated at a speed of 3,000 ft. per hour.

A new machine for picking cotton (*Texas Farm Co-operator, 35 (1912), No. 36, p. 1, fig. 1*).—A description is given of a new cotton picker, the mechanism of which consists of a 16-in. cylinder 12 in. long, on which are mounted 20 spindle-shaft frames each carrying 7 spindles, making 140 picking fingers in all. As the cylinder revolves, the spindles are caused to revolve at high speed as they stand in a vertical position and the cotton wraps around them. When they come to a horizontal position they are thrown out of gear and the cotton is stripped off and passed to a basket in the rear. It is claimed that this picker will do the work of from 10 to 12 men, requiring only a team and driver.

A new fruit-tree sprayer, C. PLATZ (*Mitt. Prüf. Stat. Landw. Masch. u. Geräte Halle, 1912, No. 164, p. 24, figs. 21*).—This pamphlet reports the results of investigations on a fruit-tree sprayer, consisting of a pressure cylinder, containing compressed air and the liquid to be applied, an air pump to supply the air pressure, a manometer to measure and gage the air pressure, a gage to regulate the supply of the liquid, and a hose with an adjustable spray nozzle, the whole being fitted with the necessary valves. The theory of the operation of this apparatus is explained and the results of pressure measurements, investigations of power required in pumping the pressure, time duration of discharge, discharge efficiency, and nozzle efficiency are given.

The conclusions are that although the apparatus in practice may not be as efficient under all conditions as the investigations show, yet it combines simplicity, ease of operation, and relatively high efficiency.

Milking machines and mechanical milking, C. HUYGE (*Ann. Gembloux, 22 (1912), No. 5, pp. 251–308, figs. 24*).—This article describes several different makes of milking machines operated by suction, compression, and suction and compression combined, and discusses the important principles of their operation and the advantages and disadvantages of mechanical milking in general, pointing out the bad effects that some machines have on the cow, and the advantages of time saving, sanitation, and flexibility of mechanical milking apparatus.

Preliminary examinations of new dairy apparatus, B. MARTINY (*Arb. Deut. Landw. Gesell., 1912, No. 219, pp. 101, figs. 41*).—This work describes and gives the results of preliminary investigations of new dairy machinery and apparatus, among which are cream separators, churns, refrigerating machinery, heating apparatus, and aparatus for testing milk and cream.

Dairy barn at University of Missouri, C. H. ECKLES (*Wallaces' Farmer, 37 (1912), No. 16, pp. 751, 752, figs. 2*).—The ground plan and general descrip-

tion of the dairy barn at the University of Missouri are given. The construction is intended to be practical and to include at the same time all the necessary features for the best sanitary conditions.

The farm stable, C. W. SLEIGH (*Trans. Highland and Agr. Soc. Scot., 5. ser., 24 (1912), pp. 40–52, figs. 10*).—The essential details of the construction of suitable farm stables are briefly given, emphasizing drainage, ventilation, light, and the comfort of the horses, and presenting original ideas as to roof, wall, floor, and stall construction.

Experiments with improved cow stalls, A. GÜNTHART (*Wiener Landw. Ztg., 62 (1912), No. 45, pp. 540, 541, figs. 5*).—The details of a cow stall are given in which a double, adjustable hanging chain is used instead of stanchions.

Cement silo construction (*Agr. Ed. [Kans. Agr. Col.], 4 (1912), No. 6, pp. 79, figs. 29*).—This bulletin gives a detailed outline of the design and construction of the monolithic silo, by G. S. Hine, and of the metal-lath silo, by G. C. Wheeler.

Farm poultry houses, J. B. DAVIDSON and W. A. LIPPINCOTT (*Iowa Sta. Bul. 132, pp. 227–251, figs. 15*).—This bulletin sets forth the essentials of a good poultry house, and emphasizes the necessity of a well-drained location and of dryness, ventilation, sunlight, and simplicity in construction to facilitate cleaning and disinfection. Plans and specifications and details of construction, with bills of material and estimates of cost, of an A-shaped portable colony house, the Iowa Station colony house, and a farm poultry house are also given.

Making a poultry house, M. R. CONOVER (*New York, 1912, pp. 54, pls. 8, figs. 4*).—This work deals with the design and construction of poultry houses and contains chapters with specific suggestions for houses, floors, foundations, roofs, walls, windows and ventilation, doors, nests and roosts, and the run, and a final chapter on general upkeep.

Wire fencing (*Canad. Thresherman and Farmer, 17 (1912), No. 7, pp. 57, 58*).—It is stated that the rusting of modern steel wire is due principally to galvanic action rather than to the thinness of the galvanizing coat, this action being brought about by the difference in chemical composition of different parts of wire manufactured from iron made by the Bessemer and open-hearth processes. When iron containing considerable manganese is used, the different iron particles of different chemical composition are caused to act as different metals, assume different potentials, and when wet cause the flow of electric currents, thus setting up galvanic action and resulting in a decomposition of the wire.

The puddled iron process is presented as a solution to the rust problem since in this process the slag and impurities are more evenly distributed throughout the metal, thus preventing galvanic action. Wire made from puddled iron is more expensive than the others, but is considered an economical investment since it lasts from 4 to 5 times as long.

See also the work of Cushman (E. S. R., 21, p. 207).

Labor-savers in the laundry, L. R. BALDERSTON (*Country Gent., 77 (1912), No. 20, p. 13, dgms. 5*).—Laundry machinery and equipment is discussed, particularly with reference to farm laundry problems.

RURAL ECONOMICS.

What is the most important problem before our rural people? (*Business America, 12 (1912), No. 5, pp. 49–57*).—Answers to the above question are presented, as follows: Education, by A. C. True; The Problem of Marketing, by F. A. Waugh; Cooperation, by C. S. Barrett; Where Are Rural People to Spend Their Money and Energy? by T. N. Carver; The District School, by E. T. Fair-

child; The Labor Income, by W. H. Wilson; and Enlarging the Agricultural Unit, by E. Davenport.

Cost accounting on farms, G. F. WARREN (*Amer. Agr., 90 (1912), No. 13, pp. 263, 264, 265*).—An address delivered before the New York State Agricultural Society in which the author compares incomes of farmers and city laborers, and discusses the cost of men and teams on the farm, equipment value, interest on investment, and various factors usually omitted in keeping farm accounts. He states that reports of receipts and expenditures as secured from 2,409 farms in 14 townships in New York indicated that but one-third of the farmers made more than hired man's wages in addition to 5 per cent interest on their capital. A similar study in 6 other States indicated that less than one-third of the farmers make farm wages.

Colonization and immigration, J. S. DUFF (*Rpt. Min. Agr. Ontario, 1911, pp. 49–53, figs. 2*).—Data are presented showing that 2,356 immigrants were sent to Ontario farms by the Bureau of Colonization and Immigration during the year ended October 31, 1911. The number of farm laborers sent by the Salvation Army is reported as 1,431.

The sum of $20,000 has been set apart for advancing part of the passage money of those who gave promise of being desirable laborers or servants. Repayments were made to an average extent of $20 each, and the plan is regarded as progressing satisfactorily.

[Cooperative agricultural distribution and production], G. S. BARNES (*Rpt. Indus. and Agr. Coop. Soc. United Kingdom, 1899–1910, pp. XXXIII–XXXIX, 61–69*).—Tables are given showing the number, membership, sales, etc., of the cooperative societies in the United Kingdom, 1895–1909.

It is noted that the number of productive societies increased from 46 in 1895 to 317 in 1909 with an increase in membership from 3,110 to 45,622. They had at the end of 1909 a sale, loan, and reserve capital of £431,348. The total sales for the year amounted to £2,005,314, upon which a profit of £23,663 was made.

A large majority of these organizations are dairying societies scattered over a considerable area and confine their operations to collecting the milk of their members and separating the cream, which they send to a central creamery. "This system of central creameries with a number of auxiliary societies is found to result in economy in manufacturing expenses, and in the reduction in the competition which ensues when a large number of small societies are each endeavoring to secure customers for their output in the same markets."

The number of distributive societies increased from 11 in 1895 to 334 in 1909; the membership from 2,418 to 39,339; the sale, loan, and reserve capital from £7,745 to £162,758; sales from £56,092 to £1,343,390; and profits from £1,032 to £12,613.

Life insurance as a means of promoting the redemption of mortgages and the acquisition of land (*Internat. Inst. Agr. [Rome], Bul. Bur. Econ. and Soc. Intel., 3 (1912) No. 8, pp. 129–146*).—This article discusses at length some recent applications of the principles of life insurance in connection with agriculture, giving special attention to an experiment made by certain Prussian Landschaften to attain, by means of life insurance, the discharging of mortgages on rural property and the investment of the money of the farmers participating in projects to the advantage of agriculture and of their local communities.

A lengthy bibliography is included.

Agricultural insurance in Denmark (*Internat. Inst. Agr. [Rome], Bul. Bur. Econ. and Soc. Intel., 3 (1912), No. 4, pp. 75–102*).—This article presents a detailed examination of agricultural insurance against fire, storms, hail, live stock, etc., as they have developed in the Danish peninsula and islands, show-

ing the working details, progress, etc., of each class of insurance for a period of years.

Cooperative insurance societies, 1899–1909, G. S. BARNES (*Rpt. Indus. and Agr. Coop. Soc. United Kingdom, 1899–1910, p. 76*).—There are in England and Wales a number of small cattle and pig insurance societies, the membership of which consists of small holders who raise by periodical assessments a common fund for mutual insurance against loss by the death of their live stock. A table is here given showing the membership, receipts, expenditures, etc., of these societies for each year from 1899 to 1909 inclusive. In 1909 there were 57 active societies with an aggregate membership of 3,954, the receipts during the year amounting to £2,256, and the expenditure to £2,295, of which £387 was for working expenses.

Royal Agricultural Benevolent Institution, W. GILBEY (*Live Stock Jour. [London], 76 (1912), No. 2003, p. 197*).—This article calls attention to the work of the Royal Agricultural Benevolent Institution of England, which seeks to provide for bona fide farmers, their wives, widows, and unmarried orphan daughters when in distress. At present 1,252 pensioners are maintained at an annual cost of £25,092. Since the institution was founded in 1860 over 4,600 persons have been granted annuities at a total cost of £710,084.

The land mortgage association of Germany, H. C. PRICE (*Wallaces' Farmer, 37 (1912), No. 39, pp. 1361, 1362*).—This article presents a study of the land mortgage associations of Germany and describes their working operations in detail.

The plan usually followed is for the landowners desiring to borrow money to form an association, and instead of each member negotiating his loan individually, they pool their interests and issue bonds against the association. The individual members give their mortgages to the association for their loans and these secure the bonds. As the members are also liable for the bonds to the full extent of their property, this gives the bonds a ready market value and makes them a favorite investment. The farmer receives a bond in return for the mortgage he gives to the association, and this he can sell personally or through the bank established in connection with the association. He usually pays 4 per cent interest on the loan, in addition to 0.25 per cent for operating expenses of the association and 0.75 per cent toward paying off the loan, so that he pays both the interest and the loan in 40 or 45 years. His rate of interest can not be increased during this time nor can his mortgage be foreclosed.

Uruguayan rural credit bank, N. A. GREVSTAD (*Daily Cons. and Trade Rpts. [U. S.], 15 (1912), No. 167, p. 300*).—This report notes that by an act of January 19, 1912, a section of rural credit with an initial capital of $500,000 was established in the central bank of Uruguay. The formation of cooperative rural credit banks to be owned by local farmers was also authorized, these to borrow from the central bank in proportion to their relative size and importance, and in turn to loan small sums to their individual members. The central bank will exercise a kind of supervisory control in regulating the general terms of the loans and mortgages, inspecting the accounting at stated periods, and aiding generally to insure the safety and efficiency of the capital invested.

The Rhodesia land bank, W. OLIVE (*Rhodesia Agr. Jour., 9 (1912), No. 6, pp. 837–841*).—This article describes the conditions and circumstances leading to the establishment of the Rhodesia land bank, together with regulations under which its work is carried on.

This institution was established to stimulate the agricultural development of Rhodesia by the advancement of money to small farmers on the security of landed property, other than town property, or on approved security. Among the principal conditions under which advances are made, are the following: Ad-

vances are made on first mortgage or for the purpose of purchasing land or to enable existing liabilities to be paid off, for the purchase of live stock, agricultural implements, etc., or for effecting improvements on land, including farm buildings, fencing, irrigation works, and afforestation. Loans may not exceed £2,000 to any one person, interest is charged at the rate of 6 per cent per annum, payable semi-annually, and loans are repaid in installments apportioned over a period not exceeding 10 years, beginning with the third year, but may be paid in a shorter period.

Social centers in the Southwest, C. W. HOLEMAN and C. D. MURPHY (*Dallas, Tex., 1912, new ed., pp. 34, figs. 11*).—This booklet discusses and illustrates the origin and growth of the social center movement in the Southwest, the needs and value of the work, and how social centers may be organized and definitely what can be done to sustain them.

Agricultural statistics, 1911 [Province of British Columbia], A. E. CRADDOCK (*Dept. Agr. Brit. Columbia Bul. 45, 1912, pp. 38, figs. 5*).—Statistics are given relating to the acreage of various crops, the number of live stock, and crop production in each of the specified districts of the Province of British Columbia for 1911. The agricultural resources are also shown as a whole, together with the estimated value of products during the year.

Agricultural statistics 1910–11, E. LAHITTE (*Agr. Statis. Argentina [English Ed.], 1910–11, pp. II+107, pl. 1*).—This is a report of the Division of Agricultural Statistics and Rural Economy in Argentina for 1910–11, including data on the area of cultivated land; area, yields, and vaule of principal crops, and returns per hectare from wheat, flax, corn, and oats from 1891 to 1910; imports and value of farm machinery and implements; rural properties, loans, and mortgages; distribution and consumption of live stock; and exports and value of farm products.

It is noted that Argentina furnished to the United Kingdom 20,613 tons of beef and 55,740 tons of mutton in 1900 and 252,057 tons of beef and 75,507 tons of mutton in 1910. The total value of the agricultural, live stock, forest, hunting, and fishing exports amounted to 153,415,751 pesos ($148,046,200) in 1900 and 369,081,620 pesos in 1910.

Agricultural statistics of Ireland, with detailed report for the year 1911, T. BUTLER (*Dept. Agr. and Tech. Instr. Ireland, Agr. Statis. 1911, pp. XXXV+147*).—This is a detailed report showing the division of land from 1841 to 1911; acreage under crops and yields by counties and Provinces; number and description of holdings; number and ages of live stock; and other agricultural data. The total area of the country is reported at 20,345,328 statute acres, of which 11.5 per cent was planted to corn, green crops, flax, and fruit in 1911, 12.4 per cent was under hay, and 48.4 per cent is classed as rotation and permanent pasture; the remainder consisting of bogs, barren mountains, water, roads, building lands, wastes, etc.

Agricultural statistics, Ireland, 1912, T. BUTLER (*Dept. Agr. and Tech. Instr. Ireland, Agr. Statis. 1912, pp. 31*).—Data similar to the above are given for 1912.

Foreign crops, April, 1912, H. C. GRAHAM (*U. S. Dept. Agr., Bur. Statis. Circ. 36, pp. 15*).—This circular notes that British India, with a population of over 300,000,000 people and a total area of 1,138,075,482 acres, has 223,000,000 acres under cultivation. About 20 per cent is irrigated, over ⅓ from government canals. Of the areas under various crops, rice with 78,731,137 acres in 1910 leads in relative importance, millet follows with 38,105,334 acres, then wheat with 22,769,918 and cotton with 13,172,188 acres. The yield of rice ranges from 700 to 1,200 lbs. per acre, wheat from 510 to 1,250 lbs. and cotton from 50 to 308 lbs. of lint per acre.

A number of tables are given showing crop areas for a number of years; the area irrigated from canals, tanks, wells, etc., by Provinces and States; the area, production, and exports of the principal crops, by countries; and other data.

Foreign crops, May–June, 1912; C. M. DAUGHERTY (*U. S. Dept. Agr., Bur. Statis. Circ. 37, pp. 19*).—This circular gives notes and statistics respecting crop conditions in various countries, together with tables showing exports of domestic wheat, wheat flour, barley, oats, flaxseed, apples, and cheese from Canada, 1903–1912; the area and production of wheat and flaxseed in British India, by Provinces, 1912 and 1911; imports of wheat and wheat flour into the United Kingdom, 1907–1911; preliminary estimate of areas under grain, etc., in France, May 1, 1912, 1911, and 1910, and final estimate of areas sown in 1911 and 1910; imports of wheat into France and Germany by countries of origin, calendar years 1907–1911; production of olives and olive oil in Spain, 1911–12, by regions; area sown to specified crops in Hungary, 1912 and 1911; area and production of specified crops in Roumania, 1911–1909; and area, production, and exports of wheat in Australia, 1900–1912; and other data.

AGRICULTURAL EDUCATION.

The present trend of agricultural education, L. A. CLINTON (*Penn. Dept. Agr. Bul. 213, 1911, pp. 178–184*).—This is a discussion of the work of the agricultural colleges and experiment stations and of the efforts being made at present to reach the individual farmer.

A redirection of agricultural education, C. L. BEACH (*Ann. Rpt. Conn. Bd. Agr. 43 (1910), pp. 19–25*).—The author briefly discusses the function and scope of the experiment station, the agricultural college, and agricultural extension work, and notes a "redirection of agricultural education at the present time, or rather the shifting of the emphasis, from the activities of the college and the station to that of agricultural extension."

Statistics of state universities and other institutions of higher education partially supported by the State for the year ended June 30, 1911 (*U. S. Bur. Ed. Bul., 1911, No. 19, pp. 23*).—This bulletin includes statistics of agricultural colleges and items of interest concerning progress in them.

Arkansas state agricultural schools, C. H. LANE (*U. S. Dept. Agr., Office Expt. Stas. Bul. 250, pp. 20, pls. 5*).—A report on a system of special agricultural schools established by a State without reference to existing political divisions and furnishing concrete information as to the origin, equipment, organization, and work of the 4 schools comprising it.

Equipment and profitableness of the farms of agricultural education institutions (*Land u. Forstw. Unterrichts. Ztg., 25 (1911), No. 3–4, pp. 287–312*).—This is a summary of information compiled from replies to 141 circular letters addressed to the agricultural education institutions in Austria by the minister of agriculture concerning the ownership, object, principal features of work, profits, value of land and equipment, etc., of their farms.

Educational and illustrative material for instruction in rural economics in vocational schools and association lectures, GEIBEL (*Arb. Deut. Landw. Gesell. 1910, No. 167, pp. 255–266*).—This is a description of the illustrative material for instruction in rural economics shown at the Eisenach exhibition of agricultural illustrative material made by agricultural teachers and pupils.

A working erosion model for schools, D. C. ELLIS (*U. S. Dept. Agr., Office Expt. Stas. Circ. 117, pp. 11, figs. 4*).—A description is given of a model designed to illustrate graphically the erosion of hillsides and the destruction of farms in the lower valleys following the complete removal of forests from the hills.

It can easily be constructed in a school building for use by classes in nature study, agriculture, and physical geography.

Farm management field studies and demonstration work in Ohio, L. H. GODDARD (*Ohio Sta. Circ. 127, pp. 172–182, figs. 2*).—An outline is given of a plan which has been adopted by the department of cooperation of the Ohio Station and the Office of Farm Management of this Department, for reorganizing the extension work which has been conducted by the station. This is followed by an account of the purpose and character of the work to be undertaken, previous experience in extension work at the Ohio Station, an agricultural survey of the State, the use of district supervisors and county agents, township supervision, farm management extension work, rural economics, and rural sociology.

Proceedings of the twenty-fifth annual convention of the Association of American Agricultural Colleges and Experiment Stations, edited by J. L. HILLS (*Proc. Assoc. Amer. Agr. Cols. and Expt. Stas., 25 (1911), pp. 229*).—An account of this convention, held at Columbus, Ohio, November 15–17, 1911, has been given (E. S. R., 26, p. 8).

Proceedings of the sixteenth annual meeting of the American Association of Farmers' Institute Workers, edited by W. H. BEAL and J. HAMILTON (*U. S. Dept. Agr., Office Expt. Stas. Bul. 251, pp. 77*).—An account of this convention, held at Columbus, Ohio, November 13 and 14, 1911, has been previously given (E. S. R., 26, p. 199).

List of agricultural and horticultural officials, institutions, and associations (*Verslag. en Meded. Dir. Landb. Dept. Landb., Nijv en Handel, 1912, No 2, pp. 120*).—This list contains the organization and personnel of the Department of Agriculture, Industry, and Commerce, including the agricultural education service, agricultural education and research institutions, agricultural and horticultural winter schools, itinerant agricultural and horticultural instructors, and agricultural and horticultural associations in the Netherlands.

MISCELLANEOUS.

Thirty-fifth Annual Report of Connecticut State Station, 1911 (*Connecticut State Sta. Rpt. 1911, pt. 6, pp. XVIII*).—This contains the organization list, a report of the board of control, in which are embodied minutes adopted in memory of the late Dr. William H. Brewer, a financial statement for the fiscal year ended September 30, 1911, and a list of corrections to the report.

Annual Report of the New Jersey Stations, 1910 (*New Jersey Stas. Rpt. 1910, pp. XVIII+424, pls. 60, figs. 5*).—This contains the organization list of the stations, a financial statement for the State Station for the fiscal year ended October 31, 1910, and for the College Station for the fiscal year ended June 30, 1910, a brief report by the director, and departmental reports, the experimental features of which are abstracted elsewhere in this issue. A report on the inspection of fertilizers has been previously noted (E. S. R., 24, p. 528), as have also been a report on the inspection of feeding stuffs (E. S. R., 23, p. 475) and an account of peach investigations at Vineland and High Bridge (E. S. R., 23, p. 734).

Monthly Bulletin of the Department Library, July and August, 1912 (*U. S. Dept. Agr., Library Mo. Bul., 3 (1912), Nos. 7, pp. 209–229; 8, pp. 233–264*).—These numbers contain data for July and August, 1912, respectively, as to the accessions to the Library of this Department and the additions to the list of periodicals currently received.

NOTES.

Alabama College and Station.—Percy F. Williams, professor of horticulture and forestry and state horticulturist, died December 4, at the age of 29 years. Professor Williams was graduated from the Massachusetts College in 1905, and after a period of commercial landscape gardening became assistant horticulturist in the station in 1908, and head of the department in the college and station two years later. He introduced the study of landscape engineering into the college, and in the station has been the author of numerous horticultural bulletins, notably on the Satsuma orange and the pecan, in which he was particularly interested.

California University and Station.—Additional appointments include President John W. Gilmore, of the Hawaii College, as professor of agronomy, and A. V. Stubenrauch, of the pomological investigations of this Department, as professor of pomology. J. E. Coit, associate professor of pomology and superintendent of the citrus substation at Riverside, has been made professor of citriculture, with headquarters at Berkeley.

Connecticut College.—Roy E. Jones has been appointed instructor in poultry husbandry.

Georgia College.—John T. Newton and J. A. Thrash have been reappointed to the board of trustees. J. E. Turlington has resigned as instructor in agronomy in the extension department.

Iowa College.—A. M. Ten Eyck, formerly superintendent of the Fort Hays substation in Kansas, has been appointed to the farm crops section of the extension department.

Maine University.—George A. Yeaton, orchardist, and Albert Verrill, assistant chemist, have resigned, the former to take up county demonstration work and the latter to enter commercial work. Elmer R. Tobey has been transferred to the position of assistant chemist.

New Jersey College.—A course in home economics is being offered for the first time as one of the short winter courses, beginning November 18 and ending February 28. It includes such special subjects as chemistry of foods, home management, horticulture, dairying, home sanitation, and invalid and infant cookery.

Ohio University and Station.—Over 100 students have been registered in the college of agriculture, which is now considerably the largest in the university. An apprentice course in animal husbandry, in which alternate years are spent in the university and on some live-stock farm selected by the department, is a new feature.

Ross M. Sherwood, George R. Green, E. P. Arzberger, H. R. Watts, J. B. Demaree, J. T. Rogers, and L. E. Melchers, assistants in forestry, animal husbandry, and botany, have severed their connection with the station. The first-named has accepted the position of instructor in poultry husbandry at the Iowa College.

Oregon College.—The stock judging pavilion was burned to the ground October 25, causing an estimated loss of $7,500. The structure is to be replaced immediately from state funds available for the reconstruction of state buildings destroyed by fire.

Pennsylvania College and Station.—Dr. William A. Buckhout, professor of botany and botanist, died December 3, at the age of 66 years. Dr. Buckhout was a graduate of the college in the class of 1868 and received the master's

degree in 1871 and that of doctor of science in 1904. His long career was spent entirely at the college, beginning in 1871 with his appointment as professor of natural history. Ten years later his title was changed to that of professor of botany and horticulture, and in 1907 to that of professor of botany and botanist. For many years he was botanist to the State Board of Agriculture, and in 1888 a member of the State Forestry Commission, doing much to promote interest in forestry. Among his investigations may be mentioned those on the effect of smoke and gas on vegetation.

Clemson College and Station.—Beginning with the next session the college is to give an intensive one-year agricultural course to students over 18 years of age who are familiar with the practical side of farming. Scholarships of $100 each and free tuition are to be given to one student from each county and to 7 from the State at large.

Recent appointments include F. T. Wilson as assistant professor of agronomy and assistant agronomist, M. P. Somes as assistant professor of entomology and zoology and assistant entomologist, O. M. Clark as assistant professor of horticulture, C. F. Niven as assistant in horticulture, T. R. Haden as assistant in animal husbandry, and F. H. Jeter as assistant to the director.

Wisconsin University and Station.—Sixteen farmers' meetings have been held this fall on county asylum and other public farms throughout the State, to demonstrate the crops grown on these farms by their superintendents in cooperation with, and under the supervision of, the college of agriculture. At 7 of these plowing contests for prizes were held, and at 4 domestic science lectures and demonstrations were given in the kitchens.

The soils department has held 6 demonstration meetings showing the effects of different treatment of the soils in several parts of the State. Most of these were held on the sandy soils where much benefit has been gained by turning under alfalfa and other legumes for green manure.

The dairy cattle breeders of the State have formed 59 community breeders' associations for the purpose of improving the breeding of their cattle and cooperation in buying of feed and marketing of stock, etc.

Frank B. Moody, a graduate of the forestry school of the University of Michigan, has been appointed assistant professor of forestry, and is to organize a school for forest rangers and give courses on woodlot management in the university.

Miscellaneous.—According to a note in *Rural New Yorker*, the General Education Board announced October 25 that it was about to begin free agricultural demonstrations for farmers in the North. Allotments of $1,500 were made for St. Lawrence County, N. Y., under the direction of the State School of Agriculture at Canton, and of $8,000 for four counties in Maine, under the direction of the University of Maine.

Lai Kuei Liang, a 1908 graduate of the Massachusetts Agricultural College, has been appointed vice minister of agriculture and forestry in the Chinese Republic, and has begun the issue of the *Chinese Agricultural Journal*.

E. L. Hsieh, a 1909 graduate of the same college, is chief of the bureau of interpretation of the same department, and is engaged in translating into Chinese the agricultural literature of other countries. H. Jen, also a 1909 graduate, is director of the agricultural experiment station at Mukden, Manchuria.

C. S. Orwin, editor of the *Journal of the Royal Agricultural Society*, has been appointed director of the Institute for Research in Agricultural Economics, recently established at Oxford University in cooperation with the Development Commission.

Prof. Etienne Foëx has been nominated assistant director of the Plant Pathological Station at Paris, France.

EXPERIMENT STATION RECORD.

VOL. XXVII. ABSTRACT NUMBER. No. 9.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

On the composition of the ash of the sap, leaves, and young stems of the wild grapevine (Vitis cordifolia), O. M. SHEDD and J. H. KASTLE (*Jour. Amer. Chem. Soc., 34 (1912), No. 10, pp. 1415–1424*).—After reviewing the results obtained by other investigators, the authors report analyses of a sample of sap obtained April 14 from the cut ends of a wild grapevine, and for purpose of comparison analyses of the leaves and young stems taken June 16, as follows:

Composition of the ash of the sap, leaves, and young stems of the wild grapevine (V. cordifolia).

Determination.	Sap (by weight).		Leaf.		Stem.	
	I. Ash of sap.	II. Fresh sap.	III. Ash of leaf.	IV. Green leaf.	V. Ash of stem.	VI. Green stem.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Water at 100°	.....	99.5340	.....	75.4700	.....	79.2500
Crude ash	.....	.1130	.....	2.3300	.....	1.0200
Organic matter	.....	.2782	.....	22.8500	.....	20.0437
Silica	0.405	.0005	5.890	.1372	0.400	.0041
Ferric and aluminum oxids	.540	.0006	.920	.0214	.030	.0003
Calcium oxid	19.490	.0220	30.900	.7200	10.920	.1114
Magnesium oxid	3.900	.0044	5.740	.1337	3.390	.0346
Soda	1.500	.0017	1.530	.0356	1.680	.0171
Potash	41.380	.0468	14.710	.3427	38.070	.3883
Phosphorus pentoxid	5.090	.0058	9.700	.2260	12.520	.1277
Sulphur trioxid	4.590	.0052	2.720	.0634	2.240	.0228
Nitrogen as nitrates	.....	.0075	.....	.0045	.....	.0056
Chlorin, sap only	.....	.0008	.....	.....	.....	.....

The sap had a faintly acid taste, was slightly acid to litmus, and 2.8 cc. of decinormal sodium hydroxid solution was required to neutralize 100 cc. of the sap against phenolphthalein. Its specific gravity was 1.0035.

Composition of sweet apricot kernels, L. ROSENTHALER and W. SCHAEFFER (*Pharm. Zentralhalle, 52 (1911), No. 19, pp. 507, 508; abs. in Chem. Zentbl., 1911, II, No. 1, p. 35; Analyst, 36 (1911), No. 426, pp. 450, 451*).—The composition of the kernels, obtained from the south of France, was as follows: Water 4.33, total soluble matter 27.87, protein 31.4, oil 53.4, reducing sugars 8.08, reducing sugars after hydrolysis 11.64, crude fiber 4.76, and ash 2.6 per cent.

"The oil expressed from the kernels had the following physical and chemical properties: Specific gravity at 15° C., 0.9182; $[N]_{D\ 25°}$ 64.7; solidifying point, 14.5°; iodin value, 95.03; saponification value, 187.76; Reichert-Meissl value 0.96; insoluble fatty acids, 73.48 per cent. The oil was optically inactive. The fatty acids gave the following values: Solidifying point, 5.1°; $[N]_{D\ 25°}$ 53.7; iodin value, 98.41; mean molecular weight, 290.55. The oil yielded negative results with Halphen's, Baudouin's, Soltsien's, and Becchi's tests, but gave a blue-violet coloration with Bellier's test, the coloration developing gradually and fading in a few minutes. The elaidin test yielded a viscous mass."

The kernels, which were edible, had a pleasant almond-like taste. They were quite different from those obtained from Japan.

Chemical-physiological examination of the tubercles on the radicles of the bean, G. Sani (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 19 (1910), II, No. 4, pp. 207–211; abs. in Centbl. Bakt. [etc.], 2. Abt., 30 (1911), No. 4–6, p. 75*).—Among the nitrogenous substances of the bean nodules the author detected asparagin, glycocoll, and phenylalanin. The total amount of nonprotein nitrogen was 0.003 per cent. A proteolytic enzym was also isolated.

Biochemical and toxicological studies on Penicillium stoloniferum, C. L. Alsberg and O. F. Black (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 19 (1912), Sect. VIIId, pp. 15–23*).—"From cultures of *P. stoloniferum* Thom, obtained from a sample of spoiled maize from Italy, a new phenolic acid of the formula $C_{17}H_{20}O_6$ was isolated in crystalline form. It resembles the lichen acids, is not toxic, and is one of the substances causing the ferric chlorid reaction of Gosio in deteriorated maize."

Progress made in the field of chlorophyll chemistry, E. W. Mayer (*Chem. Ztg., 35 (1911), Nos. 145, pp. 1341–1343; 146, pp. 1354–1356; 147, pp. 1364, 1365*).—This is a review of the work done in the field of chlorophyll chemistry.

Enzyms, P. Bergell (*Abs. in Chem. Ztg., 36 (1912), No. 8, pp. 68, 69*).—This is a review of the present status of enzym chemistry.

Investigations in regard to the chemical composition and formation of enzyms, III, H. Euler and S. Kullberg (*Hoppe-Seyler's Ztschr. Physiol. Chem., 71 (1911), No. 1, pp. 14–30; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 4 (1911), No. 8, p. 427*).—In contrast to zymase, invertase appears to be independent of the protoplasm. As the fermentation of cane sugar goes on as quickly as that of glucose and fructose it seems that the inversion process proceeds much quicker than the fermentation process. The concentration of the cane sugar solution has some influence upon both processes, irrespective of the type of yeast used in the tests. The fermentation of cane sugar goes on in the interior of the cell.

Studies on enzym action.—II. The hydrolytic action of some amino acids and polypeptids and certain esters, K. G. Falk and J. M. Nelson (*Jour. Amer. Chem. Soc., 34 (1912), No. 6, pp. 828–845*).—In this work, which is a continuation of the investigations previously noted (E. S. R., 27, p. 712), the quantity of acid produced when methyl acetate, ethyl butyrate, and olive oil was dissolved or suspended in aqueous solutions containing glycin, alanin, phenylalanin, leucin, glycylglycin, leucylglycin, glycylleucin, diglycylglycin, aspartic acid, and glutamic acid at 38° C. was determined.

"Glycin and alanin show the greatest amount of hydrolysis with ethyl butyrate and least with methyl acetate. Phenylalanin, on the other hand, shows a markedly greater action with methyl acetate, less with ethyl butyrate, and least with olive oil. Leucin gave practically no action with any of the three esters. Glycylglycin gave the same slight action with methyl acetate and ethyl butyrate but none with olive oil. With leucylglycin, glycylleucin, and digly-

cylglycin, maximum, though small, actions were obtained with ethyl butyrate, very slight but distinct with olive oil, while with glycylleucin and diglycylglycin and methyl acetate negative values were obtained. Not enough measurements were made with the former to make this last result certain."

The authors point out that despite the results obtained above there is no evidence at hand that the hydrolysis of fats, etc., by lipase is due to amino acids or polypeptids.

A proteolytic enzym in the must of overripe grapes, E. PANTANELLI (*Centbl. Bakt. [etc.], 2. Abt., 31 (1911), No. 23–25. pp. 545–559; abs. in Zentbl. Biochem. u. Biophys., 12 (1912), No. 19–20, p. 824*).—The must of overripe white and red grapes was found to contain an enzym which cleaves protein to products which are not precipitated by copper hydroxid.

The use of elastin for detecting proteolytic enzyms, E. ABDERHALDEN and K. KIESEWETTER (*Hoppe-Seyler's Ztschr. Physiol. Chem., 74 (1911), No. 4–5, pp. 411–426; abs. in Chem. Abs., 6 (1912), No. 8, p. 1015*).—Enzyms can be demonstrated in feces, various organs, and press-juices from them with the aid of elastin. A study made of the digestion of elastin and of native and coagulated egg albumin by gastric juice and pepsin-hydrochloric acid with the aid of the optical method indicated that the results obtained with gastric juice and pepsin-hydrochloric acid are not at all comparable.

The ferment nature of peroxidase, GRIMMER (*Milchw. Zentbl., 41 (1912), No. 6, pp. 165–168*).—Milk peroxidase apparently has nothing to do with the alkalinity or the inorganic constituents of milk. Peroxidase is of an organic nature and closely associated with lactalbumin.

Activation of sucrase by various acids, G. BERTRAND and M. and MME. M. ROSENBLATT (*Compt. Rend. Acad. Sci. [Paris], 153 (1911), No. 26, pp. 1515–1518; abs. in Zentbl. Biochem. u. Biophys., 13 (1912), No. 4, p. 167*).—The action of a large number of acids and acid salts was studied as regards their power of accelerating the activity of sucrase (invertase), and with particular reference to the optimum concentration of these acids.

The chemical constitution of the proteins, R. H. A. PLIMMER (*New York, Bombay, and Calcutta, 1912, 2. ed., pt. 1 pp. XII+188, figs. 6*).—In this second edition (E. S. R., 21, p. 210) a more detailed analysis of the proteins is given.

The precipitation of proteins by zinc sulphate, F. LIPPICH (*Hoppe-Seyler's Ztschr. Physiol. Chem., 74 (1911), No. 4–5, pp. 360–391; abs. in Chem. Abs., 6 (1912), No. 8, p. 1010*).—"When protein is precipitated by increasing concentrations of zinc sulphate, there are 2 maxima of precipitation, the first beginning at 0.08 to 0.1 normal, the second at 1.8 to 2 normal; between lies a minimum at which the liquid remains for a time clear. Equal volumes (5 to 10 cc.) of diluted horse serum were treated with graduated amounts (0.1 to 1 cc.) of a saturated solution of zinc sulphate, and made up to a round volume (50 to 200 cc.). The conditions corresponded to rapid equilibrium at the lower maximum. The precipitates contained, independently of the concentration of protein and the original concentration of zinc sulphate, always the same amount of zinc. The capacity of the protein to combine with zinc apparently increases with the dilution; that the zinc precipitated per unit volume remains the same seems to indicate a combination in constant proportions. The precipitations produced at the second maximum contain about twice as much zinc. The results are difficult to reconcile with the absorption hypothesis. They suggest rather a balanced reaction according to the scheme: $ZnSO_4 + 2Na\ protein \rightleftarrows Na_2SO_4 + Zn(protein)_2$. Most of the facts can be explained by the further assumption that, as salt concentration and other conditions vary, there arise such types of compound as $ZnSO_4$, protein; Zn, protein, $—ZnSO_4$; and Zn, protein."

Dilatometric investigation in regard to the precipitation of proteins. G. GALEOTTI (*Hoppe-Seyler's Ztschr. Physiol. Chem., 78 (1912), No. 6, pp. 421–434, fig. 1*).—No variation in volume takes place during the coagulation of proteins by either enzyms or heat. During the precipitation of egg albumin with the so-called precipitating reagents an increase in volume takes place, which is dependent upon and differs with the precipitating reagent employed. It is greatest with ammonium sulphate, less with the salts of heavy metals, and least with potassium ferrocyanid, phosphotungstic acid, and tannic acid.

The progressive hydrolysis of fats. A. GRÜN and O. CORELLI (*Ztschr. Angew. Chem., 25 (1912), No. 14, pp. 665–670; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 9, p. 442*).—When pure tripalmitin was treated for several hours with sulphuric acid of 66° B. at 70° C. in the proportion of 10 molecules of acid to 1 of glycerid, a fatty acidity equal to 56.5 per cent was obtained. This shows that a diglycerid is produced from a triglycerid without the production of mono-glycerid. Similar results were obtained when tristearin was treated in the same way. Attempts to isolate intermediary products failed.

The hydrolysis and constitution of lecithin. F. MALENGREAU and G. PRIGENT (*Hoppe-Seyler's Ztschr. Physiol. Chem., 77 (1912), No. 2, pp. 107–120*).—The authors found that it was possible with the aid of heat to hydrolize lecithin completely with either a decinormal sulphuric acid solution or a decinormal hydrochloric acid solution. The process takes about 5 or 6 hours, but has the advantage of not leaving an excess of acid present at the end of the process. Cholin does not influence the reaction.

Note on hydrolysis of vegetable oils by emulsion of Ricinus communis. D. SOMMERVILLE (*Bio-Chem. Jour., 6 (1912), No. 2, pp. 253, 254*).—No difference was noted in the amount of hydrolysis with castor oil or cotton-seed oil when treated with an emulsion of the castor bean, therefore it is concluded that the enzym of the castor bean does not act specifically toward its own oil. The author was not able to note any acceleration of hydrolysis by acetic acid and manganese sulphate. The lipase of the castor bean was not refractory to heat when protected by oil. Heating the emulsion to 60° C. destroyed the enzym. The bean from which the emulsion was obtained was stable when heated at 100° for 24 hours.

"Cotton oil and castor oil, when carefully neutralized and freed from proteins fail to undergo hydrolysis. If to this oil an enzymic emulsion, in which hydrolysis of fat has not yet commenced, be added, nothing results. If hydrolysis is established in the emulsion, the hydrolysis proceeds in the added oil, irrespective of whether this oil be neutral or contain within wide limits (25 per cent) free fatty acids."

The hydrolysis of saccharose by various acids in the presence of invertase. C. BERTRAND, M. and MME. M. ROSENBLATT (*Bul. Soc. Chim. Francc. 4. ser., 11 (1912), No. 4, pp. 176–186; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 6, p. 294; Ztschr. Angew. Chem., 25 (1912), No. 21, p. 1083*).—It is concluded that with invertase and perhaps with other soluble ferments we must assume that in the presence of specific colloidal substances the activity of the acid does not depend entirely upon the hydrogen ion which results from the electrolytic dissociation, but is also greatly dependent upon the nature of the radicles or anions to which the hydrogen in the acid molecule is bound.

An unrecognized source of error in the Kjeldahl-Gunning method for the determination of nitrogen. P. A. W. SELF (*Pharm. Jour. [London], 4. ser., 34 (1912), No. 2527, pp. 384, 385*).—The author sought to ascertain the cause for the low results which were often obtained with the Kjeldahl-Gunning method when comparatively large amounts of material were employed. The results of

the investigation show that where 25 cc. of sulphuric acid is used in the method 15 gm. of sulphuric acid should remain behind.

The amount of material to be taken for each determination is 3½ gm. for cereals or a material containing much carbohydrate, while the limit for fat-containing material should vary from 3 gm. for a sample containing from 5 to 10 per cent of fat and 1.5 gm. for material containing from 80 to 90 per cent. The amount of acid should be proportionately increased when small amounts of nitrogen are present.

Determination of total potassium in minerals, C. J. SCHOLLENBERGER (*Jour. Indus. and Engin. Chem., 4 (1912), No. 6, pp. 436, 437, fig. 1*).—When potassium alone is to be determined the J. L. Smith method is long and tedious and the modifications thereof leave much to be desired. The following method has been used with success in the laboratory of the Ohio Station:

"Proceed as in the regular Smith method for total alkalis until the filtrate from washing out the alkalis from the fusion is obtained. To this add a moderate excess of hydrochloric acid and evaporate to dryness on a steam bath, remote from ammonia fumes. Take up with about 2 cc. of concentrated hydrochloric acid and 25 cc. of hot water, and filter through [an Ames] suction filter into a 150 cc. beaker, washing the large beaker and filter well. Add the proper amount of hydrochloroplatinic acid solution, and evaporate on steam bath until of a semisolid consistency. The large amount of calcium chlorid present crystallizes out on cooling, but is readily soluble in acidulated alcohol. The crystalline precipitate of the potassium chloroplatinate is washed with acidulated alcohol, Gladding wash, and 80 per cent alcohol, on a filter designed especially for this work. After drying to remove alcohol, the precipitate is dissolved in hot water, the solution being received in a tared platinum dish, and after evaporation, dried and weighed."

The Ames filter, which possesses several advantages over the Gooch crucible filter for collecting and washing the potassium platinic chlorid, is described and illustrated.

Carbon dioxid: Its volumetric determination, L. T. BOWSER (*Jour. Indus. and Engin. Chem., 4 (1912), No. 3, pp. 203–205, figs. 2*).—This is a modification of the Mims method, and consists essentially of releasing the carbon dioxid from the substance under examination by means of hydrochloric acid, absorbing it in a strong alkaline solution, and measuring the absorbed gas by titration with a standard acid solution with the aid of a suitable apparatus. The apparatus is depicted, and consists of an Erlenmeyer flask holding a small separatory funnel, a short Liebig condenser having an inner tube of very small bore, and an absorbing tower. The absorbing tower consists of a glass tube containing some glass beads for the purpose of dividing the carbon dioxid, and 10 cc. of potassium hydroxid solution (50 gm. of potassium hydroxid in 100 cc. of solution) for absorbing the carbon dioxid.

On the determination of carbon dioxid in soils, L. T. BOWSER (*Jour. Indus. and Engin. Chem., 4 (1912), No. 4, pp. 265, 266*).—The method described above is considered especially adaptable to soils containing small amounts of carbon dioxid, giving more consistent results than the method generally employed.

Determination of sulphuric acid in the soil, P. DE SORNAY (*Internat. Sugar Jour., 13 (1911), No. 153, pp. 497–500; abs. in Zentbl. Biochem. u. Biophys., 13 (1912), No. 4, p. 132*).—The usual method for determining sulphuric acid in soils is deemed inexact, especially if much aluminum and iron are present. The following method is recommended for this purpose:

Ten gm. of the soil is mixed with 1 gm. of potassium nitrate and 5 cc. of water, dried on the sand bath, calcined, and treated with 25 cc. of hydrochloric

acid. The heating is continued until the mass is absolutely dry and the silicic acid is rendered insoluble. Fifty-five cc. of water and 20 cc. of hydrochloric acid are then added and the whole is heated for from 30 to 45 minutes on a sand bath, being careful not to go to the point of dryness. After filtering, the residue on the filter is washed with from 100 to 125 cc. of water. To the filtrate and washings barium chlorid is added, heated, concentrated slightly, and the remainder of the procedure conducted in the usual manner.

Report of committee of the fertilizer division of the American Chemical Society, F. B. CARPENTER ET AL. (*Jour. Indus. and Engin. Chem., 4 (1912), No. 3, pp. 223–225*).—This is a report of the committee on fertilizer legislation (potash, phosphate rock, and nitrogen), presented at the forty-fifth meeting of the American Chemical Society, held at Washington, D. C., in December, 1911.

Methods of organic analysis, H. C. SHERMAN (*New York, 1912, 2. ed., rev. and enl., pp. XVI+407, figs. 18*).—This publication (E. S. R., 17, p. 732) has been rewritten and enlarged to include a chapter on solid and liquid fuels, and sections on industrial alcohol, drying oils, crude petroleum, new international methods of glycerin analysis, and quantitative methods for assaying enzyms. The discussions on aldehydes, sugars, proteins, and food preservatives have been somewhat extended.

Allen's commercial organic analysis, edited by W. A. DAVIS and S. S. SADTLER (*Philadelphia, 1912, 4. ed., rev., vol. 6, pp. IX+726, pls. 2, figs. 6*).—This volume has been entirely rewritten. Among its contents are methods of analysis of amins and ammonium bases, anilin and its allies, naphthylamins, pyridin, quinolin and acridin bases, vegetable alkaloids, volatile bases of vegetable origin, nicotin and tobacco, aconite alkaloids, atropin and its allies, cocaine, opium, strychnos alkaloids, cinchona alkaloids, berberine, caffein, tea and coffee, and cocoa and chocolate. The properties of the above substances are also discussed.

A modified Wiley extraction apparatus, W. D. RICHARDSON and E. F. SCHERUBEL (*Jour. Indus. and Engin. Chem., 4 (1912), No. 3, pp. 220, 221*).—The Wiley apparatus has been modified into three forms so that it may be used for the extraction of tankage, cotton-seed meats and meals, meat and sausages, soap, etc.

New reactions for salicylic acid, E. BARRAL (*Bul. Soc. Chim. France, 4 ser., 11 (1912), No. 8, pp. 417–420*).—A description of 4 new reactions.

In regard to the macroscopic and microscopic detection of carotin, M. TSWETT (*Ber. Deut. Bot. Gesell., 29 (1911), No. 9, pp. 630–636; abs. in Zentbl. Biochem. u. Biophys., 12 (1912), No. 19–20, p. 778*).—Molisch's potassium and Tswett's resorcin methods are not specific reactions for detecting carotin microscopically, and they indicate only lipochromes, that is, carotin groups, which in the end means very little. Doubt also exists as to whether the red crystals obtained with the Frank and Tschirch acid method are in reality composed entirely of carotin. In all events, it will be necessary to investigate the work of those whose results were obtained with these methods, in regard to the distribution of carotin in the vegetable kingdom. It is believed that macroscopic methods will have to be used in future investigations.

The detection of adulterations by colloidal chemical methods, E. MARRIAGE (*Ztschr. Chem. u. Indus. Kolloide, 11 (1912), No. 1, pp. 1–5, figs. 8*).—As many of the fruit juices and other materials used in the manufacture of jellies and marmalades are first passed through filter presses, the materials entering into their composition can be detected only with difficulty by the usual microscopic methods. With the thought in mind that colloidal chemical methods might be effective for this purpose experiments were conducted with the following mixtures: (1) Agar (1 per cent), gel 46 gm., cane sugar 10 gm.;

(2) agar (1 per cent), gel 50 gm., cane sugar 20 gm.; (3) apple jelly; (4) apple jelly 8 parts, agar gel (agar 2½, sugar 50, water 47½ per cent) 2 parts; (5) apple jelly 6 parts, agar gel with sugar 4 parts; (6) gooseberry jelly; (7) apples 53 parts, and gooseberries 12 parts; (8) starch; (9) gelatine; (10) orange marmalade; and (11) currant jelly. The reagents used were potassium iodid and a cold saturated solution of lead nitrate. About 5 per cent of potassium iodid was added to the heated jelly, followed on cooling by the lead nitrate solution.

The lead iodid precipitate produced was found to vary in structure with the material tested. Its structural characteristics can best be studied with the microscope, although the differences can be noted macroscopically. Sugar when present seemed to influence considerably the size of the lead iodid granules produced. Emphasis is placed on the fact that much work will have to be done in this direction and that the experimental data should be accompanied by photographs for the purpose of determining the utility of the method for food inspection work.

A method for the determination of starch in food products, T. M. PRICE (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 203, pp. 6*).—This is a combination of the desirable features present in the Perrier and the Bigelow-Mayrhofer methods, and the elimination of the objectionable features contained in them. The method is as follows:

"In a 200 cc. beaker treat 10 gm. of finely divided meat with 75 cc. of an 8 per cent solution of potassium hydrate in 95 per cent alcohol, and heat on the steam bath until all the meat is dissolved. This will require from 30 to 45 minutes. Add an equal volume of 95 per cent alcohol, cool, and allow to stand at least 1 hour. Filter by suction through a thin layer of asbestos in a Gooch crucible. Wash twice with warm 4 per cent potassium hydrate in 50 per cent alcohol and then twice with warm 50 per cent alcohol. Discard the wash water. Endeavor to retain as much of the precipitate in the beaker as possible until the last washing. Place the crucible with contents in the original beaker, add 40 cc. of water and then 25 cc. of concentrated sulphuric acid. Stir during the addition of the acid and see that the acid comes in contact with all the precipitate. Allow to stand about 5 minutes, add 40 cc. of water, and heat just to boiling, stirring constantly. Transfer the solution to a 500 cc. graduated flask, add 2 cc. of a 20 per cent aqueous solution of phosphotungstic acid, allow to cool to room temperature, and make up to mark with distilled water. Filter through a starch-free filter paper, and determine the dextrose present in a 50 cc. portion of the filtrate with Fehling's solution after neutralizing the acid, using Low's method . . . for the determination of the copper in cuprous oxid precipitate. The amount of dextrose multiplied by 0.9 gives the equivalent in starch.

"The accuracy of the above-described method was demonstrated through its application to a number of samples of sausages to which known amounts of pure cornstarch had been added."

Determination of nucleic acid in the flesh of mammalia, A. SCALA (*Ann. Ig. Sper., n. ser., 20 (1910), No. 4, pp. 509–520; abs. in Zentbl. Biochem. u. Biophys., 13 (1912), No. 1–2, p. 9*).—The method rests upon the principle that when nucleic acids are treated with barium chlorid a precipitant of barium nucleinate is obtained.

Composition of dry gluten and its relation to the protein content of flour, G. A. OLSON (*Jour. Indus. and Engin. Chem., 4 (1912), No. 3, pp. 206–209*).—Believing that perhaps the reason for high-protein flours containing relatively more gluten than flours which are low in protein was due to a larger content of impurities, the author made tests with gluten from flours representing

wheats of the Bluestem, Red Russian, Turkey Red, Fife, Dale, Little Club, Galgalos varieties, and of hybrids cultivated at the Washington Station.

Summarizing results it would seem that "gluten as it is ordinarily prepared has a variable nitrogen, ash, starch, and moisture content. The peculiar copper reduction resulting from adding the filtered extract from hydrolized gluten by acid is undoubtedly due to some other substance than starch or sugar. An average of about 75 per cent of the total nitrogen of flour enters into the crude gluten. Glutens obtained from low-protein flours are not necessarily any richer in nitrogen, more free from ash, etc., than glutens derived from medium- or high-protein flours. The reason why low-protein flours yield much lower percentages of gluten than medium- or high-protein flours may be attributed to the scattering of such glutens, resulting in mechanical loss. Blending such flours with strong gluten flours results in yields comparable to those obtained for medium- and high-protein flours."

Contribution to the examination of flour, E. KOHN (*Chem. Ztg., 36 (1912), No. 14, pp. 121–123*).—For detecting foreign substances in flour, i. e., by-products, the author utilized the following method:

One-half gm. of flour is well shaken with 10 cc. of ether in a test tube and poured in a comparatively flat, large, porcelain dish. Bran, plant hairs, and wheat particles are removed from the surface of the liquid upon which they float or the ether is allowed to evaporate and the particles removed from the residue by means of a preparation needle. The particles are then washed with a little water to remove the adhering starch grains and examined in chloral hydrate. An optional qualitative method is also given.

To detect wheat, bean, or barley flour in rye flour, the author allows diastase to act on flours in an acid medium and then determines the density or the sugar content of the hydrolized mixture. The figures obtained are greatest for rye flour, least for bean flour, and greater for wheat flour than barley flour.

The Watkins test for determining the cause of sliminess in bread, H. KÜHL (*Chem. Ztg., 35 (1911), No. 143, pp. 1321, 1322*).—There are two methods which may be used for detecting the presence of the organisms which produce sliminess in bread, namely, the baking test in which 450 gm. flour and 240 cc. of water at from 40 to 42° C. are employed, and the Watkins test,[a] which is based on the fact that the bacteria producing the viscousness contain spores which resist temperatures varying between 80 and 100°, whereas spore-free bacteria are thermolabile. The latter method is of particular value where only small quantities of flour are available for the test, and it can also be employed for obtaining pure cultures of slime-producing bacteria. Some experiments with the method are reported.

The chemical differentiation of fermentation vinegar and vinegar essence, with particular reference to their formic acid content, H. FINCKE (*Deut. Essigindus., 15 (1911), No. 19, pp. 145–148*).—This is a discussion of work previously noted (E. S. R., 25, p. 311; 26, p. 208).

Standards for malt vinegar, A. C. CHAPMAN (*Pharm. Jour. [London], 4. ser., 34 (1912), No. 2527, p. 394*).—The author maintains that malt vinegar complying with the requirements set down by the U. S. Department of Agriculture as regards methods of manufacture may give analytical results well outside of the standards laid down.

"Thus, it is shown that in cases where fermentation has been very completely effected the malt vinegar may have a levorotatory instead of a dextrorotatory action on polarized light, owing to the disappearance of the dextrorotatory carbohydrate matters, and to the presence of levorotatory proteins

[a] Jour. Soc. Chem. Indus., 25 (1906), No. 8, pp. 350–357.

It is also pointed out that in the case of malt vinegar made with hard water the proportion of soluble phosphate acid may fall much below the limit laid down in the Department's regulations."

Determining the shell or hull content of cocoa by A. Goske's method, F. SCHMIDT and J. GÖRBING (*Ztschr. Öffentl. Chem., 18 (1912), No. 11, pp. 201–214*).—This is a study of the Goske method (E. S. R., 23, p. 12), which indicates that the method is unsatisfactory, especially where the cacao products have been previously prepared and ground finely. The shell content of prepared cocoa, containing from 25 to 50 per cent of shells, can not be determined with any degree of accuracy.

In regard to the detection of adulterations in paprika, A. VON SIGMOND and M. VUK (*Ztschr. Untersuch. Nahr. u. Genussmtl., 23 (1912), No. 8, pp. 387, 388*).—Previously noted from another source (E. S. R., 27, p. 715).

Artificial coloration of foods and condiments, E. SPAETH (*Pharm. Zentralhalle, 52 (1911), Nos. 10, pp. 243–251; 11, pp. 282–291; 12, pp. 310–316; 13, pp. 336–343; 14, pp. 368–374; 15, pp. 400–403; 17, pp. 459–467; 31, pp. 813–818; 32, pp. 839–843; 33, pp. 866–868; 34, pp. 893–897; 35, pp. 919–924; 36, pp. 948–953; 37, pp. 967–971; 38, pp. 998–1004; 40, pp. 1062–1067*).—This is a continuation of the work previously noted (E. S. R., 25, p. 712), and deals with the artificial coloring of conserved vegetables, crab butter (crab extract and crab powder), anchovies, caviar, egg conserves, tea, coffee, and chocolate.

Some observations on the modified LaWall method for the determination of sodium benzoate in catsups, W. D. MCABEE (*Ann. Rpt. Ind. Bd. Health, 29 (1910), pp. 323, 324*).—These studies were made with catsups which were first tested as to their freedom from benzoic acid, and known amounts of the acid then added. The method as modified by La Wall and Bradshaw (E. S. R., 20, p. 211) was found to be very accurate. Fifty gm. of catsup was used instead of 200.

Methods for determining the fat in milk, O. RAMMSTEDT (*Ztschr. Angew. Chem., 25 (1912), No. 16, pp. 754–758*).—The neu-sal method, when conducted with the acid butyrometric apparatus, was found to yield values which are comparable with those obtained by the Gerber acid butyrometric test and the Röse-Gottlieb method. The sal method on the other hand yields higher results. For heated milk the neu-sal method is thought to yield correct results, although this is contrary to the finding of other authors. The author advises, however, that the coloring matter used in the reagent should be eliminated. No acid reaction toward litmus was noted in the reagent.

Other comparative tests carried out indicate that with whole milk the Gerber acid butyrometric, the Gerber neu-sal, and the sand method (with 2 extractions of 6 hours each) yield comparable results. The Funke method yielded results which were slightly higher. The Adams, Röse-Gottlieb and usual sand methods, while comparable among themselves, gave lower results than the afore-mentioned. With top milk the following figures were obtained: "Neu-sal" and Funke 6.6 per cent, Röse-Gottlieb 6.34 per cent, Adams 6.33 per cent, acid butyrometric 6.4 per cent, sand (single extraction) 6.28 per cent, and sand (double extraction) 6.49 per cent.

Detection of watered milk by Cornalba's method, F. BORDAS and F. TOUPLAIN (*Ann. Falsif., 5 (1912), No. 42, pp. 171–173*).—The figures for total soluble solids in the serum from 100 cc. of milk were somewhat lower than those reported by other authors, varying from 5.169 to 5.94, with an average of 5.49. These differences are probably due to the use of different reagents for preparing the serum and this must be taken into account when adopting the method as a standard.

A portable outfit for the determination of visible dirt in milk. F. O. Tonney (*Amer. Jour. Pub. Health, 2 (1912), No. 4, pp. 280, 281, figs. 2*).—This apparatus consists of a Gooch crucible filter attached to a Chapman filter pump which has a rubber collar for fitting over an ordinary faucet. The filtering material consists of a very thin disk of absorbent cotton.

Comparative investigations of the bacteriological and biochemical methods for judging milk. O. Schroeter (*Centbl. Bakt. [etc.], 2. Abt., 32 (1912), No. 6–12, pp. 181–192*).—Of the 122 samples of milk utilized in this work, 89 samples consisted of ordinary market milk, 28 samples of a special milk in the original bottles, 3 samples of milk drawn in the barn of the agricultural institute of the University of Leipsic, one skim milk, and one milk purposely mixed with the milk obtained from cows suffering with mastitis. The following observations were made: (1) The total germ content on meat extract-, whey-, Heyden-, and Ragit-agar, after 3 days at 38° C.; (2) the number of lactic-acid bacteria (according to Beijerinck) upon calcium carbonate-whey-agar plates; (3) the number of coli bacteria (according to Harrison and Vanderleck) in esculin bouillon; (4) the amount and character of the sediment obtained in the leucocyte test (Trommsdorf); (5) the microscopic picture of the centrifuge residue; (6) the results obtained with the catalase test with 15 cc. of milk plus 5 cc. of 1 per cent hydrogen peroxid at 20° C., with a special form of apparatus, which is described; (7) the reductase test (O. Jensen); (8) the milk fermentation test at 38°; (9) the degree of acidity (Soxhlet-Henkel); and (10) the alcohol and boiling test.

The catalase and reductase tests for the examination of milk. G. Geudens (*Handel. Vlaamsch Natuur en Geneesk. Cong., 15 (1911), pp. 108–111*).—A description of the procedures and apparatus used for the catalase and reductase tests. The interpretation of the results is also considered.

The Schardinger reaction of cow's milk. P. H. Römer (*Biochem. Ztschr., 40 (1912), No. 1–2, pp. 5–14*).—This is a reply to Rullmann (E. S. R., 25, p. 785), supported by experimental data to show that the initial milk almost always gives a negative Schardinger test. Commercial milk samples taken at Marburg, Germany, were often found to yield negative results. The reaction will not, therefore, indicate whether a given sample of milk has been heated or not.

The effect of cooling milk upon the outcome of the Schardinger reaction. R. Burri and H. Schmid (*Biochem. Ztschr., 36 (1911), No. 5–6, pp. 376–388, figs. 4*).—The formaldehyde-methylene blue reduction reaction is somewhat dependent upon the temperature to which the milk was previously subjected. Cooling reduces the time of reduction, which probably means an increase in the enzym content. The solidification of the milk fat globules in this connection is also considered.

The behavior of sterile and boiled milk with rennet and acid. A. Kreidl and E. Lenk (*Biochem. Ztschr., 36 (1911), No. 5–6, pp. 357–362*).—Boiled, as well as sterile milk, can be coagulated with rennet. Sterile vessels for holding the milk, or sterile rennet, are not necessary, and in fact, sterile milk with an acidity not over 22 cc. of tenth-normal acid when treated with sterile rennet in a sterile vessel will not coagulate, though touching the milk so kept with an unsterile finger, or the addition of a few drops of ordinary milk, will bring about coagulation. The lactic-acid bacillus multiplies best in a slightly acidified milk (from 0.2 to 0.6 cc. of tenth-normal acid to 10 cc. of milk). The addition of an acid to a sterile milk contained in a sterile vessel, to the extent of 2 cc. tenth-normal hydrochloric acid to 10 cc. of milk, produces no precipitation, even after acidification at blood heat.

The reaction of rennet on milk. M. Nierenstein and Jessie Stubbs (*Journ. Agr. Sci., 4 (1912), No. 4, pp. 371–375*).—The conclusions drawn in this work

were as follows: (1) The acidity of milk is not due entirely to the formation of lactic acid, but partly to some product produced from caseinogen. (2) Pure lactic acid cannot be used as a starter in Cheddar cheese making, though it stimulates the production of acid from caseinogen. (3) The retardation of the time of coagulation with rennet is not entirely dependent on the calcium salts.

Investigations in regard to the hemolytic action of cow's colostrum, W. KÖBELE (*Centbl. Bakt. [etc.], 1. Abt., Orig., 61 (1912), No. 7, pp. 561–589; abs. in Centbl. Bakt. [etc.], 1. Abt., Ref., 52 (1912), No. 21, p. 653*).—The colostrum of some cows contains amboceptor and complement, the former being extinct 2 days post-partum. Both of these are present in the initial and end milk in about the same quantity. They originate from the blood serum which gains access to the milk during the colostral period.

In regard to milk hemolysis, B. SCHMIDT (*Arch. Kinderheilk., 56 (1911), No. 4–6, pp. 342–358; abs. in Berlin. Tierärztl. Wchnschr., 28 (1912), No. 27, p. 501*).—The hemolytic method advocated by Bauer and Sassenhagen (E. S. R., 23, pp. 114, 513) for detecting colostral and mastitic milk was found satisfactory. Instead of using guinea-pig blood rabbit blood can be employed. When bovine serum is used it must be previously titrated.

Viscosimetric studies on human milk, K. BASCH (*Wiener Klin. Wchnschr., 24 (1911), No. 46, pp. 1592–1595; abs. in Chem. Abs., 6 (1912), No. 5, p. 645*).—The viscosity was diminished as the period of lactation went on, until it reached a constant value.

A small contribution from dairy laboratory practice, M. SIEGFELD (*Molk. Ztg. [Hildesheim], 26 (1912), Nos. 34, pp. 617, 618; 35, pp. 631–633*).—This is a discussion in regard to Storch's reaction, the determination of fat according to the Gottlieb method, the determination of fat in cream, the composition of various proprietary preservatives for milk and milk products and other preparations, determinations of iron in curd which indicate that the Schaeffer test (E. S. R., 22, p. 212) is unreliable and the potassium sulphocyanid test is more satisfactory, the detection of iron in dairy salt, and other data. In some of the tests mentioned improvements and substitutions are suggested.

Detection of iron in cheese curd, H. SCHERER (*Molk. Ztg. [Hildesheim], 26 (1912), No. 40, pp. 738, 739*).—The author maintains that aside from the fact that the results when obtained on the bases of Schaeffer's color table only refer to 20 gm. of curd instead of 100 gm. of curd, the method is practical and exact and can be used without any difficulty by the practical dairyman. Siegfeld's contentions (see above) are therefore not considered to be entirely borne out.

Detection of iron in cheese curd, M. SIEGFELD (*Molk. Ztg. [Hildesheim], 26 (1912), No. 45, p. 838*).—In reply to Scherer (see above), the author points out that iron is not present in a soluble form nor is it evenly distributed in the cheese curd. The reason that Scherer obtained a stronger reaction with ammonium sulphid than with potassium sulphocyanid was probably because of the uneven distribution of the iron in the cheese samples which he examined.

Determination of moisture and fat in cheese, H. LÜHRIG and E. NOCKMANN (*Molk. Ztg. [Hildesheim], 26 (1912), No. 37, pp. 669–671*).—Some comparative tests were made with two methods, (a) and (b), for determining the moisture content of cheese. In method (a) from 3 to 5 gm. of the cheese mass, mixed with ignited sand or pumice stone in a platinum dish, is dried in a vacuum desiccator for a few days and then for 8 hours in a steam bath at from 97 to 99° C. Method (b) utilizes the same amount of cheese, evenly distributed in a platinum dish and heated first on a water bath and then finished in a glycerin water bath at from 102 to 105° for from 4 to 6 hours.

Both methods yield practically the same result, but (a) is recommended because it is more conveniently conducted. The Bondzynski-Ratzloff method is recommended for determining the fat in cheese.

Method for determining salt and fat, R. H. SHAW (*Cream. Jour., 23 (1912), No. 10, pp. 12, 13, 16, fig. 1*).—Previously noted (E. S. R., 27, p. 614).

The adulteration of butter, A. ELOIRE (*Hyg. Viande et Lait, 5 (1911), No. 12, pp. 681–697; 6 (1912), No. 1, pp. 12–33*).—This is a review of existing methods for detecting abnormal butter and adulteration in butter. The results of examining different kinds of butter are also included.

Methods of detecting adulterations in butter, L. ROBIN (*Ann. Falsif., 5 (1912), No. 42, pp. 180–187*).—This is a simplification of the methods previously noted (E. S. R., 18, p. 709). It describes the preparation of the reagents and the procedure for determining fatty acids soluble in alcohol, the fatty acids soluble in water, and the fatty acids insoluble in water but soluble in alcohol, with the interpretation of the results obtained.

Determination of fat in feed stuffs and seeds, M. MONHAUPT (*Chem. Ztg., 35 (1911), No. 141, p. 1305*).—A formula is given for calculating the fat content of certain substances when determining the fat by the shaking-out method. An aliquot of the ethyl ether or petroleum ether extracts is taken for the determinations. The formula can also be employed in all cases where a soluble constituent of known specific gravity is shaken out with a definite amount of appropriate solvent from the substance under examination.

A method for differentiating sterilized from unsterilized bone meal, E. POLENSKE (*Arb. K. Gsndhtsamt., 38 (1912), No. 4, pp. 559–561*).—As ground bones are often used for feeding stock, including poultry, and may have originated from diseased animals, the author recommends the following method for determining whether or not the bone has been sterilized.

Ten gm. of the meal is mixed with 30 cc. of cold water and allowed to stand for 24 hours, shaking occasionally during this time. The mixture is then filtered and the filtrate poured back upon the filter until a clear fluid is obtained. To 10 cc. of the filtrate is added 2 drops of concentrated acetic acid, the mixture brought to the boiling point, and the tube with its contents placed in a water bath held at 95° C. for ½ hour. If a flocculent deposit is produced the material was not sterilized previously.

In regard to the behavior of invert sugar in an alkaline solution and in the presence of hydrogen peroxid, A. JOLLES (*Biochem. Ztschr., 36 (1911), No. 5–6, pp. 389–393*).—This is a continuation of the work previously noted (E. S. R., 26, p. 307).

Comparison between the double polarization method of determining sucrose and the direct polarization after destruction of the reducing sugars, H. PELLET (*Internat. Sugar Jour., 14 (1912), No. 159, pp. 161, 162; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 7, p. 351*).—"A number of comparative determinations with the Pellet-Lemeland and other methods of determining sucrose have been carried out, the following results being obtained: Direct polarizations, defecating with basic lead acetate, 33.7; direct polarization, using hypochlorite and normal lead acetate for clarification, 28.9; direct acid polarization, using hydrochloric acid and urea (Andrlík), 30.9; sucrose by double polarization, using the neutral direct polarization, and verified constants, 38.9; sucrose by double polarization, employing the acid (Andrlík) direct polarization, and verified constants, 38.6; direct polarization, after destruction of the reducing sugars, by the Pellet-Lemeland procedure, 38.8; sucrose by double polarization, using the solution in which the reducing sugars had been destroyed by the Pellet-Lemeland process, 38.5; sucrose by determining the reducing sugars before and after inversion, and operating directly on the

sample, 38.3. Six other samples were also examined by the double polarization method and the results compared with those found by direct polarization after the destruction of the reducing sugars by the Pellet-Lemeland method, the following being the figures obtained: By the double polarization method, using for the direct reading the solution clarified with hypochlorite and defecated with normal lead acetate: (1) 45.3; (2) 39.4; (3) 39.7; (4) 35.9; (5) 40.2; and (6) 37.5; and by direct polarizations, after destruction of the reducing sugars: (1) 46.3; (2) 39.4; (3) 37.5; (4) 35.5; (5) 39.0; and (6) 38.4."

Gravimetric determination of saccharose by oxidation with chromic acid, A. WECHSLER (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 40 (1912), No. 5, pp. 683–703, figs. 1*).—Saccharose when present alone is oxidized in a special form of apparatus, which the author calls an "oxydimeter," with a mixture consisting of 500 cc. of commercial sulphuric acid, 300 cc. of water, and 100 gm. of chromic acid. Fifty cc. of this mixture is added to an amount of saccharin substance which will contain on an average from 0.15 to 0.25 gm. of carbon to be oxidized. Inorganic substances when present have no influence upon the oxidizing process. The results obtained by the method for refined sugar and beet extracts agreed well with the polarimetric findings. Basic lead nitrate was used as the precipitating and clearing agent for the beet pulp. A new method for determining the ratio of saccharose to nonsugar during the process of manufacture, on the basis of the oxidizing and polarimetric test, is also included.

The inversion of saccharose by bees' honey, O. ACHERT (*Ztschr. Untersuch. Nahr. u. Genussmtl., 23 (1912), No. 4, pp. 136–139*).—A honey-saccharose mixture in which the honey was never heated to over 55° C. showed an inversion of the saccharose to the extent of reducing it from 22.05 to 2.21 per cent in a period of 4 months. Heating to 100° destroyed the inverting enzym, as found by Moreau (E. S. R., 26, p. 312). Acids like formic play no part in the inversion process, as neutralized samples were found to be inverted much more quickly and to a greater extent than those containing free acid.

Incrusting coloring matter of sugar cane, L. C. LANGGUTH-STEUERWALD (*Arch. Suikerindus. Nederland. Indië, 19 (1911), No. 47, pp. 1543–1557; Meded. Proefstat. Java-Suikerindus., 1911, pp. 365–379, pl. 1; abs. in Deut. Zuckerindus., 37 (1912), No. 1, pp. 5, 6; Chem. Ztg., 34 (1912), No. 12, Repert., p. 55*).—In the cane, and apparently also in the cane juice, a new coloring substance, which is termed saccharetin, was noted. The purified substance corresponded to the formula $(C_5H_7O_2)n$, has the characteristics of a phlobaphene, is light yellow in color, optically inactive, slightly acid, and is soluble only in alcohol, glacial acetic acid, and akalis.

The Andrlík method of polarization as applied to cane products, H. PELLET (*Internat. Sugar Jour., 14 (1912), No. 157, pp. 28–30*).—If a sufficient amount of lead salts is added to pure sugar solutions about to be tested according to the Andrlík procedure, constant polarizations can be maintained for some time. Instead of the dextrorotatory power being decreased, as is the case with the usual procedure, it is slightly increased, this being due to the volume of lead precipitated.

The author points out that he has collected the results of a large number of experiments with different products of cane and beet-sugar manufacture, and that these show that when the above mentioned factors are considered, good results can be obtained with the method. In some tests between the Andrlík hydrochloric acid and urea method (E. S. R., 26, p. 207) and the Pellet sulphurous acid method for beet molasses the results obtained were practically the same.

In regard to determining the acidity of cane juice, P. A. Yoder (*Jour. Indus. and Engin. Chem., 3 (1911), No. 9, pp. 640–646, figs. 2; abs. in Ztschr. Angew. Chem., 25 (1912), No. 21, pp. 1082, 1083*).—Most of the literature in regard to the determination of acids in wine fermentation products, fruit juice, etc., does not take into account the aconitic acid which is usually present, and which constitutes in Louisiana cane juice most of the acidity present. The utility of the well-known existing methods for isolating and determining the various acids present and the behavior of these acids and their salts toward solvents were studied. It was found that aconitic acid, succinic acid, and lactic acid can be easily removed quantitatively from the juice by extraction with ether, but tartaric, malic, and citric acids can not be isolated satisfactorily by this method.

In testing the solubility and the precipitability of the calcium salts of these acids the salt of aconitic acid was found to have the same property which calcium citrate possesses, i. e., precipitation by heat from its aqueous solution. The solubility of calcium malate in 50 per cent alcohol gives a basis for a method for separating it from other acids except lactic acids. The barium salts behave like the calcium salts in regard to solubility. The separation of aconitic acid from succinic acid in the shape of the acid ammonium salt was not satisfactory. Denigès' method was satisfactory for detecting citric acid but has the objectionable feature that it is also positive for aconitic acid.

A practical illustration for determining the several acids from cane juice is given.

Some recent work on molasses analysis, W. E. Cross (*La. Planter, 48 (1912), No. 22, pp. 382, 383*).—A critical review of the literature in this regard.

The determination of nitrogen in betain, H. Stoltzenberger (*Ztschr. Ver. Deut. Zuckerindus., 1910, No. 675, II, pp. 440–445*).—This is a contribution to the question of determining nitrogen in molasses and vinasse.

Complete oxidation of the betain can only be brought about by heating the sample with concentrated sulphuric acid for several hours. By the addition of copper sulphate, mercuric oxid, and phosphorus pentoxid to the acid mixture, the oxidation process can be accelerated considerably. To determine the nitrogen in substances containing betain the following procedure is recommended by the author:

About 3 gm. of molasses or 2 gm. of vinasse is placed in a 500 cc. Kjeldahl flask and 25 cc. of a sulphuric acid-phosphorus pentoxid mixture (100 gm. of phosphorus pentoxid in a liter of acid) and 1 gm. of powdered potassium sulphate and 1 gm. of mercuric oxid added. The mixture is then heated until decolorized, and 1 hour in addition. After cooling and diluting with 120 cc. of water, 2.2 gm. of powdered sodium thiosulphate and ½ teaspoonful of pipeclay are added; the pieces of clay must have the size of a pinhead or of small shot. After setting up a receiver which contains 50 cc. of decinormal hydrochloric or sulphuric acid for collecting the distillate, 90 cc. of a 22 per cent sodium hydrate solution is added to the mixture, the flask quickly connected with the condenser and distilled until bumping begins. The remainder of the process is the usual one.

Extraction of oil from the olive, E. Mingioli (*Petite Rev. Agr. et Hort., 18 (1912), No. 421, pp. 133, 134*).—A description of the Acapulco method and its advantages and disadvantages.

A comparative study of methods for the determination of hard and total soft resins in the hop, H. V. Tartar and C. E. Bradley (*Jour. Indus. and Engin. Chem., 4 (1912), No. 3, pp. 209–212*).—This is a comparative study of some of the present methods, including Briant and Meacham's, Siller's,

Lintner's volumetric method for soft resins (original and modified), and the authors' methods for determining the resin constituents of hops. The authors' methods, which they think will overcome some of the objections present in the other methods, are as follows:

"Ten gm. of hops is placed in a Soxhlet extractor and extracted with ether for 8 to 10 hours. The ethereal extract thus obtained is filtered and the filtrate made to 200 cc. volume.

"Total resins.—One hundred cc. of the ether solution (equivalent to 5 gm. of hops) is placed in a 250 cc. Erlenmeyer flask and nearly all of the ether removed by distillation on a water bath at about 40° C. The last portion of the ether is completely removed by drying in a vacuum desiccator at room temperature. The residue remaining is then taken up with alcohol to free the wax, filtered, and the filtrate made to 100 cc. volume. A 20 cc. aliquot (equivalent to 1 gm. of hops) is transferred to a tared beaker and the alcohol removed by evaporation in a vacuum oven at 50° to constant weight. The residue thus obtained is the total resins in 1 gm. of hops.

"Total soft resins.—The remaining 100 cc. of the original ether extract is transferred to a 200 cc. Erlenmeyer flask and the ether nearly removed by distillation at low temperature, the last portion being removed by evaporation in a vacuum desiccator at room temperature. The residue is taken up with about 100 cc. of petrolic ether (boiling point 40 to 45°). The residue is worked up in the solvent with a glass rod and then let stand a short time to effect the complete solution of the soft resins in the solvent. The hard resin is then removed by filtration. The petrolic ether is removed from the filtrate in the same manner as the ether in the first part of the determination. The residue is taken up with alcohol to remove wax, filtered, and the filtrate made to 100 cc. volume. An aliquot of 20 cc. (equivalent to 1 gm. of hops) is transferred to a tared beaker and evaporated and weighed as under the determination of total resins. The hard resin is estimated by difference between the total resins and soft resins."

The detection of methyl alcohol in commercial alcohol preparations, A. Hellriegel (*Pharm. Ztg., 57 (1912), No. 1, p. 7; abs. in Chem. Ztg., 36 (1912), No. 21, Repert., p. 102*).—A portion of the sample is distilled and some of the distillate obtained is mixed with one-half its bulk by weight of burnt lime and boiled under a reflux condenser for 3 hours. The mixture is then distilled from a dry flask, which contains a thermometer, the boiling point is noted, some oxalic acid dried at 100° C. added, and the mixture kept boiling for 1 hour. On cooling, crystals of the dimethyl ester of oxalic acid, a liquid which has a boiling point of 54°, will be found deposited in the bottom of the flask.

The activities of the agricultural experiment station at Hildesheim, Aumann (*Ber. Landw. Vers. Stat. Hildesheim, 1911, pp. 15*).—This report includes the results during 1911 in examining fertilizers, feeding stuffs, seeds, dairy products, stock feeds and condiments, and miscellaneous substances.

METEOROLOGY—WATER.

The structure of the atmosphere in clear weather, C. J. P. Cave (*Cambridge, England, 1912, pp. XII+144, pls. 33, figs. 47; rev. in Met. Ztschr., 29 (1912), No. 8, pp. 397, 398*).—Data obtained from 200 pilot balloon ascensions at Ditcham, England, are summarized and discussed, together with the methods employed and their accuracy. "A general summary of the results obtained is given . . . in which certain types of structure in the atmosphere are recognized, and the different types are considered in their relation to the wind

at the surface, the gradient wind, and the general distribution of pressure and temperature in the region."

Bulletin of the Mount Weather Observatory (*U. S. Dept. Agr., Bul. Mount Weather Observ., 5 (1912), pt. 1, pp. 1–82, figs. 24*).—This number contains the following articles: Daily Changes in Temperature up to 4,000 Meters (illus.), by A. J. Henry; and Free Air Data at Mount Weather for January, February, and March, 1912 (illus.), by W. R. Blair.

Monthly Weather Review (*Mo. Weather Rev., 40 (1912), Nos. 7, pp. 977–1142, pls. 9; 8, pp. 1143–1292, pls. 9*).—In addition to the usual climatological summaries, weather forecasts and warnings for July and August, 1912, river and flood observations, lists of additions to the Weather Bureau library and of recent papers on meteorology, a condensed climatological summary, and climatological tables and charts, these numbers contain the following special papers:

No. 7.—The Richmond Tornado of May 12, 1912, by J. H. Kimball; Tornado at Grand Rapids, Mich., by C. F. Schneider; Local Storms in July, 1912, by U. G. Purssell, C. J. Root, and V. H. Church; A Phenomenally Heavy Rain at Alton, Ill., by M. W. Hayes; Severe Thunder Storm at Minneapolis, Minn., July 12, 1912, by M. R. Hovde; Wisconsin River Flood, July, 1912, by J. H. Spencer; Flood in Cherry Creek Basin, Colorado, July 14, 1912, by P. McDonough; Excessive Rains in Louisiana, by E. D. Coberly; Storm of July 19, 1912, Salt Lake City, Utah; Storm at Mazuma, Nev., by H. F. Alps; Recent Storms at Murray, Utah, by R. C. Towler; The Relation Between Light Precipitation and "Alkali," by R. A. Hart; Notes on the Rivers of the Sacramento and Lower San Joaquin Watersheds during July, 1912, by N. R. Taylor; Frost Fighting at Pomona, by J. E. Adamson; Variation of Rainfall with Altitude, by A. G. McAdie (see p. 817); Reconnoissance of the Deschutes River in July, 1912, by J. H. Lewis; Occurrence of Precipitation on Change of Wind to North with Approach of a High Barometer, by D. F. Manning; and Climate of Prince Georges County, Md.

No. 8.—The Avalon Tornado of August 21, 1912, by J. H. Kimball; Mammatocumulus Clouds, by J. H. Kimball; Heavy Rainfall at Dubuque, Iowa, by J. H. Spencer; August, 1912, Flood of the Wisconsin River, by J. H. Spencer; Electric Induction by Clouds during Thunderstorms, by H. A. Frise; A Severe Storm at Concordia, Kans., by J. W. Byram; Tornado at Booneville, Ark., by H. F. Alciatore; Cause of the Equable Temperature Conditions at New Orleans, La., by E. D. Coberly; Notes on the Rivers of the Sacramento and Lower San Joaquin Watersheds during August, 1912, by N. R. Taylor; Notes on Streams and Weather of the Upper San Joaquin Watershed, by W. E. Bonnett; Note on Formation of a Cloud during Forest Fire, by F. H. Carpenter; and Dog Days.

The action of forests on late frosts, E. Cuif (*Ann. Sci. Agron., 4. ser., 1 (1912), 11, No. 3, pp. 161–166; abs. in Rev. Sci. [Paris], 50 (1912), II, No. 24, pp. 755, 756*).—Data regarding temperature conditions in forests and in the open are cited to show that forests lower the maxima and raise the minima of temperature, reducing the damage from late frosts.

Distribution of the temperature at various heights from the ground during frosts, G. Koslovskii (*Khozâistvo, 7 (1912), No. 25, pp. 841, 842; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 9, p. 1926*).—Observations during a night of heavy frost showed the lowest temperature at a height of 2 ft. 4 in. above the ground. At 4 ft. 8 in. the temperature was almost twice as high and at 14 ft. the temperature was but slightly or not at all below freezing. "For this reason trees in flower suffered very little, less than shrubs; the leaves of the vine were scorched precisely at a height between 2 ft. 4 in. and 3 ft. 3 in."

Variation of rainfall with altitude, A. G. McAdie (*Mo. Weather Rev., 40 (1912), No. 7, p. 1107*).—Observations at different elevations on the San Joaquin River, California, are summarized. These show that the average increase in rainfall up to 3,500 ft. was at the rate of 1 in. per hundred feet. The average increase up to 2,441 ft. was at the rate of 0.73 in. per hundred feet, while the average rate of increase in the level between 2,441 and 3,500 ft. was at the rate of 1.45 in.

Rainfall in tropical areas and variations observed corresponding to the changes in the moon's phases, F. White (*Proc. Rhodesia Sci. Assoc., 11 (1911), pt. 1, pp. 57–86, figs. 6*).—A study of rainfall data at three places (Bulawayo, Selukwe, and Salisbury) lying within the tropics in South Africa, here presented in detail, are stated to indicate a decided correlation between rainfall and lunar phases. "The summaries of the totals of the three stations for each of the seven days of each lunar period give 6.44 in. of rainfall, which is the minimum, precisely at the time of the full moon, and 26.46 in. as the maximum, which falls one day after the day of the new moon. The next highest figure, 26.29 in., follows the day of the last quarter."

Measurements of evaporation from lakes, K. Fischer (*Met. Ztschr., 29 (1912), No. 8, pp. 366–372, fig. 1*).—Observations on lakes in the Alps and in Prussia are reported and discussed, particularly with reference to the accuracy of the methods used.

Evaporation in Egypt and the Sudan, J. I. Craig (*Cairo Sci. Jour., 6 (1912), No. 68, pp. 103–107; abs. in Met. Ztschr., 29 (1912), No. 8, pp. 392, 393*).—Data for measurements of evaporation in 6 districts of Egypt and the Sudan are summarized and the accuracy of the observations is discussed.

The water supply of Indiana (*Ann. Rpt. Ind. Bd. Health, 29 (1910), pp. 349–356, figs. 4*).—The results of examinations of a large number of samples of water collected by health officers are presented graphically and briefly discussed.

The results show that the public water supplies were superior in character to the private supplies. Of the public water supplies examined 129 were from deep wells, 24 from shallow wells, 16 from streams, 14 from ponds or lakes, 7 from springs, and 1 from a cistern. The private supplies were drawn from 212 deep wells, 357 shallow wells, 24 springs, 31 cisterns, 3 streams, and 3 ponds. Of the 341 samples of deep well waters examined, 303 were good, 18 were bad, and 20 were of doubtful quality. Of the 381 shallow well samples 185 were of good quality, 158 bad, and 38 of doubtful quality. Of the 19 samples of stream waters examined 10 were good, 6 bad, and 3 doubtful. Of 17 samples of pond water 14 were good and 3 doubtful. Of 31 samples of spring water analyzed 22 were good, 2 bad, and 7 doubtful. Of 32 samples of cistern water 20 were of good quality, 11 bad, and 1 doubtful. A large percentage of the waters used by families in which a case of typhoid fever had occurred were unqualifiedly bad.

Sewage sludge disposal, W. B. Ruggles (*Manfrs. Rec., 62 (1912), No. 15, p. 51*).—This article briefly describes what is being done in a number of places in England in the way of utilizing sewage sludge as a fertilizer.

It is stated that "there is no question at the present time of the value of the sludge as a fertilizer. This has been amply proved, and there is a constantly increasing demand for it at prices ranging from $5 per ton to $12, depending on the amount of nitrogen contained.

"Where lime is used as a precipitant, part of the nitrogen is converted into ammonia and is lost, so that such sludge will only contain about 1.5 per cent of nitrogen, leaving a value of about $6 per ton, while sludge precipitated by sulphuric acid or sulphates will contain at least 2.5 per cent, with a value of $10 per ton or more.

"The cost of producing such fertilizer, including pressing the sludge, drying, grinding, and bagging, will vary somewhat with the size of the plant and quantity produced, but should not cost over $1.75 per ton at any plant producing 10 tons or more per day."

SOILS—FERTILIZERS.

What the States are doing toward the conservation and improvement of soil fertility, T. N. CARVER (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 24 (1912), Sect. XIb, pp. 47–57, fig. 1*).—This is an address delivered before the Eighth International Congress of Applied Chemistry in which the author gives an account of the activities of the various States in the promotion of irrigation and drainage work, the prevention of soil erosion by forestation and other means, and the direct improvement and conservation of the fertility of the soil by scientific methods of culture.

The author maintains that "the only legitimate purpose of soil improvement and conservation is to increase the product per man, and a larger product per acre is desirable only when it gives us a larger product per man." It is a thing to be shunned "if it is to be secured by those forms of intensive culture which are forced upon overpopulated countries where labor is abundant and cheap and land scarce and dear." Judged by the standard of utilizing labor so as to secure the largest income per man or per family, and thus to live upon as high an economic plane as possible, "our system of agricultural education makes an excellent showing as compared with that of other countries, though there is much to be done yet."

Recent advances in agricultural science.—The fertility of the soil, A. D. HALL (*London: Roy. Inst. Great Brit., 1912, pp. 9; Nature [London], 89 (1912), No. 2234, pp. 648–651; Sci. Amer. Sup., 74 (1912), No. 1920, pp. 246, 247*).—This is an address delivered before the Royal Institution of Great Britain in which the author outlines three stages in the development of the agriculture of a country, namely, (1) the period of exploitation, (2) the conservative period, and (3) the period of intensive agriculture, illustrating each by farming systems in vogue in different countries and tracing the inner history of these three stages of agriculture by the records of certain experimental plats at Rothamsted.

It is shown that in maintaining the level of intensive production the losses, particularly that of nitrogen, due to bacteria in the soil, are increased out of all proportion until there is recovered in the crop only about one-fourth of the nitrogen applied in the manure. Hence, there must be returned to the soil not merely the nitrogen contained in the extra amount of crop produced but several times that amount to repair the waste, and still greater amounts when the fertility and the production are increased.

In the author's opinion, therefore, the important problem in intensive agriculture to-day is the reduction of this waste of nitrogen due to bacterial action. He points out, on the basis of the work of Russell and Hutchinson at Rothamsted (E. S. R., 22, p. 121), that by putting the soil through various processes of partial sterilization, such as heating or treatment with antiseptics like chloroform or toluene, "we can eliminate certain organisms which keep in check the useful bacteria in the soil, that is, the bacteria which break down the nitrogen compounds to the state of ammonia, a form assimilable by plants. . . . At present the processes have not been extended to the open field, but progress is being made in that direction, and give some promise of a method by which ultimately the unseen fauna and flora of the soil will be domesticated, the useful races encouraged, and the noxious repressed."

Some problems in soil fertility, G. SEVERANCE (*Washington Sta. Popular Bul. 44, pp. 8*).—This is a brief, popular discussion of various factors influencing the fertility of soils, with particular reference to Washington soils.

A case of soil infertility due to bad texture and lack of lime, J. A. HANLEY (*Jour. Bd. Agr. [London], 19 (1912), No. 5, pp. 375–378*).—With a view to determining the cause of the infertile condition of the soil of a portion of a field near Luton, Bedfordshire, the author made physical analyses of the soil and determined its calcium carbonate content. The results showed that the infertile condition was due to the unfriable nature of the soil, caused by its low calcium carbonate content, the samples analyzed containing 0.28 per cent of this constituent in both surface and subsoil, as compared with 2 per cent for the surface soil and 1 per cent for the subsoil of samples of the productive soil of the field.

Reference is also made to analyses of samples of soil of the Geescroft field at Rothamsted and of a similar soil at Hamsey Green, Surrey, both of which showed a low calcium carbonate content and were in a very poor state of tilth.

Studies on soil physics.—II, The permeability of an ideal soil to air and water, W. H. GREEN and G. A. AMPT (*Jour. Agr. Sci., 5 (1912), No. 1, pp. 1–26, pl. 1, figs. 10*).—The authors review previous investigations on the subject by others, particularly the work of Slichter and of King (E. S. R., 11, pp. 519, 523), and in continuation of earlier work (E. S. R., 25, p. 620) report measurements of the permeability of glass beads and quartz sand to air and to water. An elutriation method and apparatus for grading the particles are described.

The permeabilities of the glass beads, both to air and water, were from 50 to 85 per cent greater than the value calculated from Slichter's formula. This is held to be due to Slichter's method "of considering each soil capillary as if it were a double triangular-shaped pore with a partition down the center instead of as an undivided more or less rhomboidal pore at its narrowest part." When this condition was fulfilled, the permeability of the glass beads approached the value calculated in the formula.

The permeability of the sand, although subject to a rather large percentage error, was on an average "9.45 for the permeability to air . . . and 9.31 for the permeability to water. . . . The obvious explanation (of this less perfect material agreeing more perfectly with the theoretical formula) is that the angular shapes of the particles do practically have the effect of dividing the pore into two triangular passages as assumed in the formula."

The general conclusion, therefore, is that "the formula $\eta P = 10.2 \frac{d^2}{k}$ holds quantitatively for variations of the pore space and of the diameters of the soil particles. This will be so whether the permeating fluid be air or water, provided that the actual sizes of the soil particles are unaffected by the presence of water.

"With this factor taken into account it is, therefore, legitimate to consider a soil as statistically composed of a bundle of capillary tubes when discussing the movements of air and water through it."

Observations on liquids circulating in cultivated soils, G. GOLA (*Ann. R. Accad. Agr. Torino, 54 (1911), pp. 33–67, fig. 1*).—This article has been noted from another source (E. S. R., 26, p. 422).

The movement of water in irrigated soils, J. A. WIDTSOE and W. W. MCLAUGHLIN (*Utah Sta. Bul. 115, pp. 195–268, figs. 8*).—This is a detailed report of a series of irrigation investigations conducted by the Utah Station in cooperation with this Office, and reports a study of the mutual relationships of water, soils, and crops under cropped field conditions, the work having been partly reported upon in previous publications (E. S. R., 22, p. 425). The ex-

periments were made on a deep soil of uniform physical and chemical composition at the experiment farm at Greenville. The irrigation water used contained less than 375 parts per million of dissolved substances.

Summarizing the results of the work, the authors conclude that the maximum amount of water held by the soil in question against gravity under field conditions was about 24 per cent (on a dry basis) and the minimum amount above 8 per cent except that the soil of the top foot dried out to 5.64 per cent.

"Irrigation was needed whenever the soil moisture fell below 12 per cent.

"The degree to which water may be removed from the soil depends upon the kind of crop grown; and the degree of dryness at which irrigation is necessary likewise depends, in a limited measure, upon the kind of crop.

"Soil water was abstracted from below the depths of root penetration.

"Water applied in irrigation, whether of large or small amount, penetrated in the soil below the depth reached by augers, 8 ft. long.

"The percentage of soil water soon after an irrigation was invariably largest in the top foot, and became smaller with increasing soil depth.

"Under given conditions of soil, crop, water, and time after irrigation, the distribution of the soil water is always the same. This implies the operation of a definite law governing the distribution of soil water.

"It would seem that the water added to a soil of the Greenville type, up to about 12.75 per cent on the dry basis, is held very firmly by the soil, and can move only with great difficulty. Water added above this point moves freely in obedience to capillary laws.

"It is suggested that the point below which capillary movements become sluggish be called the point of lento-capillarity.

"It would appear that water added to a soil above the point of lento-capillarity is distributed through the soil inversely with the distance from the source of supply, which is the zone of wettest soil. This law of distribution takes the form of the formula of the equilateral hyperbola.

"Plants may use the soil water below the point of lento-capillarity, but not readily.

"Plants can not use any of the true hygroscopic water. The hygroscopic capacity depends largely on the amount of clay or other colloidal substances found in the soil.

"In soils of the Greenville type, under field conditions, there are several critical soil water points: The maximum capillary water content, which is about 24 per cent; the optimum water content, to a depth of 8 ft., about 18 per cent; the lento-capillary point, about 12.75 per cent; and the hygroscopic capacity about 6 per cent.

"In furrow irrigation, the amounts of water under row and furrow are unequal near the surface, but become more uniform at lower soil depths. This indicates that the lateral movement of soil water increases with the depth.

"Evaporation from bare soils is large, but may be checked by early and thorough cultivation. On the Greenville farm, under average conditions on cropped plats, a little more water was taken from the soil by evaporation than by transpiration. The rate of loss of soil moisture from cropped soils depends on a number of factors.

"The removal of water from the soil by transpiration varies with the ease with which water may be obtained, that is with the amount of water in the soil at the beginning of an experiment. It would appear that the rate of loss of soil water varies directly with the cube root of the percentage of water in the soil above the point of lento-capillarity.

"The loss of soil water increases steadily with the time after irrigation. Moisture conserving methods should, therefore, be applied early.

"The relation of meteorological conditions to the rate of loss of soil water is important, but somewhat obscure. Temperature is probably the most important factor; then sunshine; and then relative humidity.

"The larger the percentage of water in the first foot, the more rapidly is water drawn from the soil. This is probably due in part to the larger development of plant roots near the surface.

"Early maturing crops cause the highest rate of loss of soil moisture. Different crops leave different percentages of water in the soil at the time of harvesting.

"The rate of loss of soil water varies with the age of the crop. Less water is used during the early and late periods than during the middle one.

"When water is abstracted from a soil, the loss is felt by every foot to the depth reached by the augers.

"When a practical irrigator declared irrigation to be necessary, the soil was found to contain from year to year about 13 per cent of water."

The biochemical relation of phosphoric acid in the soil, MÜLLER (*Mitt. Deut. Landw. Gesell., 27 (1912), No. 33, pp. 470, 472, 473*).—This is a review of the work of Stoklasa (E. S. R., 25, p. 624) on this subject.

Soil conditions and plant growth, E. J. RUSSELL (*New York, Bombay, and Calcutta, 1912, pp. VIII+168, figs. 9*).—This treatise by the former soil chemist and present director of the Rothamsted Experimental Station, is one of the series of monographs on biochemistry edited by R. H. A. Plimmer and F. G. Hopkins. Its purpose is to give a concise and orderly account of the present knowledge of the soil as a medium for plant life. It is a comprehensive critical survey of the literature of this subject, and while presenting the gist of the more important and fundamental contributions to the knowledge of the subject, points out what has really been demonstrated and in what directions further investigation is necessary. The book is therefore of special value to the investigator.

The first chapter is historical and introductory, others deal with the requirements of plants, the constitution of the soil, the carbon and nitrogen cycles in the soil, the biological conditions in the soil, the soil in relation to plant growth, and soil analysis and its interpretation. An appendix gives methods of soil analysis and a select bibliography of the subject.

Some observations on the effect of soil aeration on plant growth, C. HUNTER (*Proc. Univ. Durham Phil. Soc., 4 (1911–12), No. 4, pp. 183–186, pls. 2*).—Observations on the growth of sunflowers, peas, wheat, and cress in soils of five different textures with and without artificial aeration are reported. Observations were also made on the varying moisture and bacterial contents and on the resistance of the soils to the movement of air.

The results indicated an optimum amount of circulation of air in the soils for different kinds of plants. "The circulation of the air in the soil affects the development of the root system and through that the development of the subaerial portions of a plant. The production of artificial air currents in the soil appears to be beneficial to plant growth. This point is at present undergoing further investigation."

The relation of different systems of crop rotation to humus and associated plant food, G. W. WALKER (*Minnesota Sta. Bul. 128, pp. 165–186*).—The author reviews investigations by others on the physical and chemical properties of, and methods of determining, humus and in continuation of previous work by Hays (E. S. R., 20, p. 435), reports a study from 1895 to 1905 of the changes produced in humus and of the proportion of the total nitrogen, phosphoric acid, and potash associated with the humus in soil of plats under known cropping and fertilizer systems. The term humus is used by the author to

designate that portion of the organic matter of the soil soluble in dilute solution of ammonia and sodium hydroxid after removal of the lime and magnesia by treatment with dilute hydrochloric acid.

The centrifugal method was used in making the determinations, a preliminary comparison of this and the official method having shown that by using the centrifuge the time was considerably shortened and the results were equally accurate. The humus ash was a little lower for the centrifugal method.

Summarizing his results the author concludes that "continuous cropping to corn, mangels, and wheat causes a depletion of humus; on the other hand, field peas increase the amount of humus. Generally rotation of crops increases the amount of humus, the increase being greatest when clover is plowed under. There is a fair agreement in regard to the direction of the changes in humus as compared with the changes in total nitrogen and humus-nitrogen: continuous cropping causing depletion, and rotation of crops an increase.

"Except in the case of wheat, no marked decrease in total phosphoric acid has occurred in the continuously cropped plats. Generally, under systems of crop rotation, the plats have maintained the total phosphoric acid content for the 10-year period. The humus-phosphoric acid has decreased in all the plats, with one exception, both under continuous cropping and systems of crop rotation; the depletion being greater in the continuously cropped plats.

"No definite conclusions can be drawn from the results obtained for total potash. However, a much greater depletion occurs in the case of wheat than in the other continuously cropped plats. In general, a marked decrease in humus-potash has occurred in the continuously cropped plats, as compared with the rotation plats. In the rotation plats a decrease of humus-potash has occurred in all the plats, except those which received applications of stable manure. The relatively large proportions of nitrogen, phosphoric acid, and potash associated with the humus indicate the great importance and value of the latter as a source of plant food."

The distribution and activities of bacteria in soils of the arid region, C. B. LIPMAN (*Univ. Cal. Pubs. Agr. Sci., 1 (1912), No. 1, pp. 20*).—Recognizing the important differences in physical and chemical characteristics between soils of humid and those of arid regions as shown by the work of Hilgard and Loughridge, the author undertook a study of the ammonifying, nitrifying, and nitrogen-fixing powers of different soil types of the arid region of California as compared with those of humid sections. The determinations were made for every foot of soil to a depth of 12 ft. A modified Remy solution method was used, since the direct soil culture method was not considered feasible for obtaining in an uncontaminated condition such large amounts of soil as these experiments required. The samples of soil were obtained "from a hole 12 ft. in depth with at least one vertical wall, the latter when sterilized being sampled."

It was found that these soils, which are considered typical of the arid region, showed ammonifying powers at all depths studied but generally most vigorous in the first 6 or 8 feet. "In one case ammonification was noted in soil from a depth of 15 ft., or adjoining the water-table."

Nitrification occurred commonly down to a depth of 5 to 6 ft. In one case soil from the 8 ft. depth showed a vigorous nitrifying power. There was no nitrogen fixation through Azotobacter "below 2 ft. in the soil usually, but [it] has been found in some soils at 3 ft. and in one soil down to 4 ft. Many soils in the arid region, otherwise favorably constituted, do not contain Azotobacter organisms."

In general, the lower layers of arid soils differed markedly from those of humid regions in ammonification and nitrification and to a less extent in nitro-

gen fixation. These characteristics "help to explain the favorable physical and chemical constitution of the soil and also the deep rooting of plants so characteristic of the arid regions."

The law of minimum, I. POUGET and D. CHOUCHAK (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 4, pp. 303–306, figs. 2*).—Referring to an article by P. Mazé noted elsewhere (E. S. R., 27, p. 721), the authors offer what is claimed to be strong experimental evidence in favor of a law of minimum which, it is claimed, plays an important part in large scale cultivation, especially in dry soils.

A contribution to the knowledge of the black cotton soils of India, W. H. HARRISON and M. R. R. AMASWAMI SIVAN (*Mem. Dept. Agr. India, Chem. Ser., 2 (1912), No. 5, pp. 261–280, pls. 4; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 20, pp. 999, 1000*).—The authors review previous investigations on the subject by Leather (E. S. R., 10, p. 421) and by Annett (E. S. R., 23, p. 316), and report studies of the geological distribution of the regur or black cotton soils of India and the chemical and physical characteristics of the soil particles, with a view of determining the cause of the black color of the soils.

It is concluded from the results that "the black cotton soils of India are not derived from any specific geological formation, such as trap, but are formed from many diverse formations and generally, when not alluvial, bear a close relationship to the underlying rocks.

"Titaniferous magnetite is not a constant factor in the regur soils of the Madras Presidency, and, even when found, the amount is small, but its presence in quantity is characteristic of the soils of the trap area. It can not, therefore, be looked upon as the cause of either the color or the physical properties of these soils, but only as a modifying agent.

"The color and peculiar physical properties of black cotton soils are associated with the compound particles of low specific gravity, which are found in all these soils.

"Two classes of substances have been recognized as conferring the color and physical properties. One is probably a colloidal hydrated double iron and aluminum silicate, which is mainly concerned with the formation of compound particles and which possesses, in a modified form, the properties of ordinary clay. The other is organic in character and may possibly be an organic compound of iron and aluminum."

The soils of Webster County, A. M. PETER and S. C. JONES (*Kentucky Sta. Bul. 162, pp. 135–169, pl. 1*).—This bulletin, which is based on work done in cooperation with the Kentucky Geological Survey, reports a survey with map of the soil types of the county, including mechanical and chemical analyses of typical samples and pot experiments with a soil similar to the upland type of the county, to determine the fertilizer and crop adaptation.

The area is typical of the western coal field of Kentucky, including about 4,500 square miles or about one-eighth of the total area of the State. The soil types established are the yellow silt loam (hilly), the yellow silt loam (undulating), gray silt loam, gray clay loam, and a dark-brown clay loam covering, respectively, 36.1, 27.3, 25.3, 8.1, and 3.2 per cent of the area.

The results of preliminary pot fertilizer tests seem to indicate on the whole that "phosphorus decidedly increased the yields of wheat, oats, and clover, but not that of tobacco; that nitrogen decidedly increased the yields of wheat, oats and tobacco, but not that of clover; that potassium moderately increased the yields of wheat and oats and slightly increased that of clover, but did not have a marked effect on that of tobacco. Rock phosphate, used alone, gave consistent gains, except with tobacco. Used with manure, however, its effect seems to have been negative, contrary to the usual teaching. Limestone pro-

duced moderate increase with oats and clover and with tobacco following clover. Used with phosphorus on clover there was a decided increase over the pot where phosphorus alone was tried."

Protocol of the sixty-eighth session of the Central Moor Commission (*Protokoll der 68. Sitzung der Central-Moor-Commission. Berlin, 1912. pp. 258. pls. 2, fig. 1*).—This is a detailed report of the proceedings of this commission at its session from February 29 to March 2, 1912. Reports are given as to the progress made by the various local associations in the colonization of these lands and in the production of different crops and methods of cultivation and fertilization. A report of the work of the moor experiment station, consisting principally of studies in crop adaptation and methods of cultivation and fertilization of the soils, is included.

Report of the chemist, P. L. Gile (*Porto Rico Sta. Rpt. 1911, pp. 15–23*).—This is a brief report of progress in the examination of bat guanos (see p. 825), study of the effect of the lime-magnesia ratio in plant growth, effect of calcareous soils on the composition and health of plants, and the treatment of "sick" red clay soils.

The atmosphere as a raw material in fertilizer production (*Manfrs. Rec., 62 (1912), No. 11, pp. 48, 49*).—This article refers to the installation of a plant for the manufacture of calcium nitrate from the nitrogen of the air at Nitrolee, S. C., and to a proposed plant for the same purpose in Alabama. It also discusses briefly the present status of the manufacture of nitrogen compounds from the air.

Supposed loss of nitrogen in calcium cyanamid (nitrolime), G. Liberi (*Ann. R. Staz. Chim. Agr. Sper. Roma, 2. ser., 5 (1911), pp. 163–177; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 18, p. 890*).—Exposure for 50 days to severe and constantly changing atmospheric conditions resulted in a loss of only about 3 per cent of the total nitrogen of the cyanamid.

Instability of the cyanamid nitrogen in calcium cyanamid (nitrolime), G. Liberi (*Ann. R. Staz. Chim. Agr. Sper. Roma, 2. ser., 5 (1911), pp. 179–197, figs. 2; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 18, pp. 890, 891*).—Loss of nitrogen from crude calcium cyanamid was greatest in damp air and but slight in dry air. The nitrogen of the cyanamid completely disappeared in 1 and 5 per cent solutions, rapidly at first, more slowly afterwards. The loss was more rapid in the stronger solution. The dicyandiamid nitrogen increased rapidly at first and then gradually declined. No ammonium compounds were found in either solution.

A new artificial manure (*Queensland Agr. Jour., 29 (1912), No. 4, pp. 315, 316*).—Brief reference is here made to a British consular report from Christiania, Norway, calling attention to a by-product of the manufacture of nitrate of lime at Notodden, Norway, known as biphosphate and containing 26 per cent of phosphoric acid, 92 per cent of which is citrate-soluble, and 23.8 per cent of nitrate of lime.

The principal catalytic fertilizers, E. Miège (*Jour. Agr. Prat., n. ser., 24 (1912), No. 32, pp. 171–173*).—A brief résumé is given of results of experiments by various investigators on the fertilizing effect of compounds of manganese, boron, aluminum, zinc, uranium, copper, lithium, bromin, fluorin, and iodin. The author concludes that the results obtained in experiments with these compounds emphasize the insufficiency of our knowledge of the physiology and chemistry of plants and indicate enormous possibilities in the way of extending and improving methods of fertilizing the soil.

[**The toleration of coffee and of cacao plants for sodium chlorid**], J. Kuijper (*Dept. Landb. Suriname Verslag, 1911, pp. 11, 12*).—In view of the fact that the water available for sprinkling and also for irrigation purposes

during dry seasons in Dutch Guiana contains rather large amounts of sodium chlorid, experiments were made with coffee and cacao plants grown on red sandy soils in plats and in pots, respectively, to determine the amount of this salt which these plants would tolerate.

In case of the coffee plants, it was found that a concentration of 0.1 per cent showed a slight discoloration of the leaves in only one case, whereas the use of water containing 0.3 per cent caused considerable injury, as was manifested in the shedding of some of the leaves. A 1 per cent solution killed the weaker plants and caused some discoloration of the leaves of the more vigorous plants.

In case of the cacao plants, it was found that the 2, 3, and 4 per cent solutions had a direct injurious effect. The leaves became markedly discolored and dropped off. There was only a very slight injury in case of the 1 per cent solution. The 0.5 per cent solution did not injure the plants to any appreciable extent.

The availability of the nitrogen and phosphoric acid in bat guanos, P. L. GILE (*Porto Rico Sta. Rpt. 1911, pp. 16–18*).—Analyses of 18 samples of Porto Rican bat guanos are reported and reference is made to plat experiments to correlate their actual relative fertilizing value with the chemical analyses. These samples showed nitrogen varying from 0.4 to 5.49 per cent and phosphoric acid from 4.35 to 26.18 per cent.

Regarding the fertilizer value of pond mud, P. KOSSOVICH (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 13 (1912), No. 4, pp. 537–549*).—A comparative study of the composition of mud of a pond situated near Orel, Russia, and of the soil of the surrounding district is reported.

The results show that the mud analyzed did not have a high fertilizer value, and that its constitution was similar to that of the local soils. The calcium carbonate and the magnesium carbonate contents of the mud were relatively high (about 3 per cent combined), notwithstanding the almost entire absence of these constituents in the soil, thus indicating that the pond water was not derived alone from the surface water but also from waters of the calcareous loess substratum.

The high citric-acid-soluble character of the phosphoric acid of the mud was significant, 0.15 per cent, or approximately ten times that of the soil, being soluble, notwithstanding the fact that the total phosphoric acid content of the mud was only slightly higher than that of the soil (0.32 per cent and 0.298 per cent, respectively). The potash content soluble in 10 per cent hydrochloric acid was 0.44 per cent for the mud as compared with 0.24 per cent for the soil. The amount of water-soluble constituents of the mud was relatively high, being 0.36 per cent before, and 0.23 per cent after, ignition. The nitrogen content of the mud was 0.27 per cent as compared with 0.345 per cent for the soil.

Guadeloupe's use of fertilizers, F. T. F. DUMONT (*Daily Cons. and Trade Rpts. [U. S.], 15 (1912), No. 256, pp. 556, 557*).—Statistics of the fertilizer trade in Guadaloupe are briefly summarized. It is shown that in 1911 4,360 metric tons of fertilizer, valued at $293,769, were used, or an average of 109 lbs. per acre of cultivated area. These fertilizers were imported almost exclusively from France and Great Britain.

Fertilizers in Russia (*Bd. Trade Jour. [London], 78 (1912), No. 815, p. 74; Handelsmuseum, 27 (1912), No. 24, p. 350; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 9, pp. 1956, 1957*).—It is stated that there has recently been a substantial growth in the consumption of chemical fertilizers in Russia, which may be attributed either to the agricultural progress of the country or to partial exhaustion of the high fertility of some of the soils, black soils in particular. The fertilizers are now largely

imported, the imports nearly trebling in the 5 years, 1907 to 1911. In the latter year the imports amounted to 362,629 tons valued at $3,675,060.

AGRICULTURAL BOTANY.

The influence of the concentration of dissolved nutritive substances on their absorption by plants, I. POUGET and D. CHOUCHAK (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 25, pp. 1709–1711, fig. 1*).—Continuing previous work regarding the relations between the concentration of dissolved nutritive substances and their absorption and assimilation by plants (E. S. R., 24, p. 423; 25, p. 127), the authors make the following statements:

At very low concentrations (in case of phosphoric acid less than 0.1 mg. per liter) absorption of the solute does not take place, but such substance tends rather to pass from the cells containing it into the solvent in either mineral or organic form. If, however, the concentration of the solute is continuously raised, absorption begins at a certain point (a) and its rate increases faster than does that of concentration. At a second point (b) the two rates become proportional and remain so to a third point (c) beyond which concentration increases faster than absorption, the latter now being regulated not by concentration but by utilization of that solute by the cell. The general course of these changes depends upon the particular substance absorbed, the state of the plant, and the vegetative period in which it is tested.

It was found that in very dilute solutions the absorption of nutritive substances was much greater than that of the water. The above results are held to show (1) that soil water, in spite of its low content of the elements of fertility, ought to play an important rôle in the elaboration of crops; (2) that is, if the concentrations of all the elements necessary to the plant are higher than the point (c), nutrition goes on normally and the crop does not depend upon climatic conditions; but (3) if the concentration of such elements (or even only of one, according to the law of minimum) is below that point the crop returns will depend upon the concentration of that element.

The influence of radio-active mineral on the germination and on the growth of wheat, A. J. EWART (*Jour. Dept. Agr. Victoria, 10 (1912), No. 7, pp. 417–421*).—The author tested the influence of radio-active mineral, known to accelerate germination of cereals, on the development of bacteria and on the growth of wheat when applied as a manure. It was found that in the first case a distinctly retardative action is exercised which becomes more pronounced with longer exposures, and that in the second any early stimulating effect becomes converted into an injurious one on prolonged contact. He concludes that, in practicable applications, radio-active material does not appear to have any direct value for the growth of wheat.

The action of uranium on the vegetable cell, C. ACQUA (*Arch. Farmacol. Sper. e Sci. Aff., 14 (1912), No. 2, pp. 81–84*).—Pursuant to previous investigations on the influence of radio-active substances on the life processes of plants (E. S. R., 24, pp. 230, 531) the author now reports that uranium can be absorbed by certain cells of higher plants, in which it hinders karyokinesis, checking cell division. This influence is said to be considerable in the tissues of the root system, but much less so in the stem tissues on account of less ready absorption there. Thorium and manganese are said to show somewhat analogous properties, but the latter in much less degree and in a way more compatible with the development of the plant.

The influence of narcotics on the chemical composition of plants.—I. The chemical behavior of plants in acetylene atmosphere, V. GRAFE and O. RICHTER (*Sitzber. K. Akad. Wiss. [Vienna], Math. Naturw. Kl., 120 (1911),*

I, No. 10, pp. 1187–1229).—This report, in continuation of work on the influence of gases on plants (E. S. R., 25, p. 434), gives the results obtained by the authors in their study on the development and chemical products of potato, flax, and various leguminous plants grown in dilute acetylene gas.

Acetylene in various dilutions (from 0.69 to 0.038 per cent by volume) was found to give marked contrasts in development as compared with those of the control plants. For example, in dilute acetylene there was shown more glycerin and fatty acid, but less sugar, fat, and amido compounds than in plants grown in pure air. Corresponding to these chemical conditions and in part explained by them are noted such physiological differences as heightening of turgor, bursting of seedlings, checking of growth in length, augmentation of that in thickness, etc.

A bibliography is given.

The influence of ultraviolet rays on higher plants, A. J. Kluyver (*Sitzber. K. Akad. Wiss. [Vienna], Math. Naturw. Kl., 120 (1911), I, No. 10, pp. 1137–1170, pl. 1*).—After reviewing briefly similar studies by other investigators, the author reports on his own experiments with ultraviolet rays from the mercury vapor lamp on various plants in regard to the effect of these short wave lengths on the life of the cells and on their coloring matters and starch.

It is said to have been found that several higher plants are injuriously affected by the mercury vapor light, this effect being attributed mainly to radiations of shorter wave length than 300μ, and being prevented by interposition of glass plates of 0.2 mm. thickness, which are known to absorb nearly all such short waves. It is held that such short solar rays are absorbed by the atmosphere, rendering artificial protection to these plants unnecessary. The injurious effects of waves longer than 300μ are said to be limited in case of leaves to the epidermis, but sometimes to extend more deeply in case of stems and roots.

Anthocyanin appears, in general, to be not very sensitive to ultraviolet rays, being removed only from the lower leaf surface of *Begonia discolor* and that simultaneously with the death of the epidermal cells. Chlorophyll is little, if at all, affected by the longer waves, which alone are able to penetrate to the parenchymatous cells. In isolated cases (*Nerium oleander* and older needles of *Taxus baccata*) the cuticle protected even the epidermal cells from the injurious action of the shorter waves. Leaves of *Mimosa pudica* showed stimulation response to the ultraviolet rays. Destructive changes are said to have been produced in the woody walls of certains cells, and starch is said to show a decrease on exposure to these shorter wave lengths.

The influence of light on the flowering of Japanese hops and hemp, J. Tournois (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 4, pp. 297–300*).—The author reports further experiments (E. S. R., 26, p. 432) with *Humulus japonicus* and *Cannabis sativa* in regard to their time and mode of flowering, in the present cases as related to differences in illumination.

Plantings of seeds were made on January 8 and 28, and the plants obtained from each group showed, as in previous experiments, an early and a late flowering period. The precocity of flowering in this case was augmented in correspondence with early planting and the weaker illumination of the winter days. Plants from seeds sown late in April and also those from sowings early in June (normal) and grown in darkness from 8 a. m. to 2 p. m. daily, flowered much more precociously than did plants normally illuminated but otherwise similarly treated.

The sexual anomalies previously noted are said to have been more accentuated in plants obtained from the earlier winter seedings made in the present

series of experiments. Decreased illumination is held to be an important factor in all these anomalies.

The relations between oxidation ferments and respiration in plants, E. W. SCHMIDT (*Naturw. Wchnschr., 26 (1911), No. 17, pp. 257–264; abs. in Bot. Centbl., 119 (1912), No. 20, pp. 492, 493*).—This is a critical review of recent articles on respiratory ferments, etc., particularly those of W. Palladin and his school.

Tannin content and starch formation in woody growths, A. RENVALL (*Bot. Centbl., Beihefte, 28 (1912), 1. Abt., No. 2, pp. 282–306*).—The author made a study of numerous trees as to the relation of their tannic acid content in the winter to their development of starch in the following spring.

It was found that in those structures deficient in tannin and in those trees in which it appeared wholly wanting there was no corresponding lack of starch development in spring. From a study of the details observed the conclusion is drawn that tannin in the cases studied can have little or no significance as a transformation product, or as an agent influencing transformation, so far as starch is concerned. Further studies are promised on starch transformation in leaves which remain green during the winter.

Some conditions influencing the fixation of nitrogen by Azotobacter and the growth of the organism, FLORENCE A. MOCKERIDGE (*Ann. Bot. [London], 26 (1912), No. 103, pp. 871–887*).—The author's investigations on the production of a vigorous culture of Azotobacter led to the following conclusions:

The presence in the medium, as a neutralizing agent, of an excess of calcium or magnesium carbonate or of basic slag, is more advantageous than that of sodium hydrate. The presence of sodium salts is unnecessary and depressing. A good growth being once obtained, the yield of nitrogen appears to be practically proportional to the food supplied. The most active fixation occurs during the first week, being thereafter depressed, apparently, by the accumulation of the products of vital activity. It appears that a proportion of 0.4 per cent of basic slag has the most beneficial effect upon the activity of the organism, 1 per cent showing a second and lower maximum. It is thought probable that the iron and manganese present in the slag exert, in addition to a neutralizing effect, tonic influences upon the organisms, these reaching maxima at 0.4 and 1 per cent, respectively.

The formation and physiological significance of the root nodules in the Podocarpineæ, ETHEL R. SPRATT (*Ann. Bot. [London], 26 (1912), No. 103, pp. 801–814, pls. 4*).—The author reports on a series of investigations made with Podocarpus, Microcachrys, Dacrydium, Saxegothæa, and Phyllocladus, all possessing root nodules. These nodules are claimed to be modified lateral roots, perennial and usually unbranched.

Pseudomonas radicicola penetrates by way of a root hair to the cortical cells of the root, where it propagates itself, infecting the meristematic tissue and stimulating the development of a nodule which, when mature, is traversed for about half its length by a small stele. Nodules of the Podocarpineæ differ from those of all other nonleguminous plants in that there is no differentiation of a meristematic zone in the cortical tissue. Many cortical cells of root and nodule eventually become water storage cells, some containing bacteria in a quiescent state during the winter. The bacteria form a very definite zooglea in the cells, slime threads passing from cell to cell.

The bacteria isolated from the nodules of the Podocarpineæ are found to be identical with *P. radicicola* obtained from those of the Leguminosæ, Cycadaceæ, Elæagnaceæ, Alnus, and Myrica; capable of assimilating atmospheric nitrogen; and presumably of benefit to the Podocarpineæ.

A bibliography is given.

On well-marked aerotropic growths of Bacillus megatherium, J. C. JOHNSON (*Ann. Bot.* [*London*], *26* (*1912*), *No. 103, pp. 949, 950*).—The author reports on his observations made for 3 years with the annual periodicity of growths of this bacterium on the dead extremities of the roots of a palm. The growths are still being watched for any gradual change from the flat films to the raised growths observed, in the hope of showing a connection between ordinary free-living bacteria and the more highly specialized fructifications of the Myxobacteriaceæ.

Spiræa ulmaria and its bearing on the problem of xeromorphy in marsh plants, R. H. YAPP (*Ann. Bot.* [*London*], *26* (*1912*), *No. 103, pp. 815–870, pls. 3, figs. 11*).—This is a study of the xerophytic characters exhibited by meadow sweet, reviewing also the present state of knowledge in regard to swamp xerophytes, and leading to the following general conclusions:

Xeromorphy is of physiological utility to those bog and marsh plants which exhibit such characters, these being directly related to the needs imposed upon the plant by the special nature of its habitat. In each case, however, the special regulatory devices are required to meet not so much the every-day needs as the extremes, possibly even only the occasional extremes which the species has to face in nature.

An extensive bibliography is given.

Studies on the progress of plasmolysis, K. HECHT (*Beitr. Biol. Pflanz., 11* (*1912*), *No. 1, pp. 137–192, pls. 2, figs. 6*).—The author reports that, in studies made by him of plasmolyzed cells, he still observed, following the rupture and separation of the cytoplasmic envelope from the cell wall, numerous connecting threads of very different sizes, and also connecting with these a protoplasmic network adhering closely to the cell wall. To both these structures, it is thought, both hyaloplasm and nucleoplasm contributed, microsomes and chlorophyll grains being found together, particularly in the larger plasma masses remaining near the cell wall. The presence of this lining, it is thought, may be the result of some interaction of the plasmic components.

The part played by living cells in sap ascent, A. URSPRUNG (*Bot. Centbl., Beihefte, 28* (*1912*), *1. Abt., No. 2, pp. 311–322*).—The author discusses the work of several other investigators as well as some of his own on this subject, concluding with the assertion that the efforts of Dixon and Overton (E. S. R., 21, p. 318; 25, p. 220) to refer the death of the leaves after partial death of the stem to poisoning or to plasmolysis are not conclusive; also that the same may be said in regard to Overton's defense of the view that sufficient water may be carried past killed portions of the stem for the nourishment of the leaves.

Studies on regenerative processes in plants, B. KABUS (*Beitr. Biol. Pflanz., 11* (*1912*), *No. 1, pp. 1–52, figs. 23*).—Investigations were made on both the underground and aerial parts of a considerable number and variety of plants regarding their modes and rates of forming new tissue when wounded, as for example in grafting, the conditions under which it occurs, and the factors favoring or hindering its occurrence.

It was found that cork formation in case of wounded potato tubers follows access of air. Sugar formed at the cut surface in the presence of air was partly withdrawn and partly utilized in the formation of wound periderm. The cut cells turned brown on contact with air. The presence of eyes is not necessary to the growing together at the cut surfaces by two tubers, but it does hasten such union. Lower temperatures may prevent the union even of tubers provided with eyes. The vascular bundles seemed to play an important part in this process.

In subterranean parts of *Dahlia variabilis*, *Sauromatum guttatum*, and *Boussingaultia baselloides* the presence of buds was not necessary to union, but it

was essential to that of aerial portions. In these also the young growing leaves could be grafted at their growing points. The first impulse to union was found to proceed from the stalk. Monocotyledons, it was found, could be grafted in regions where cells were still capable of division.

Heat evolution by wounded plants, H. TIESSEN (*Beitr. Biol. Pflanz., 11 (1912), No. 1, pp. 53–106, pls. 2, figs. 13*).—The author studied the thermal effects following the wounding of potatoes, apples, radishes, carrots, and beets.

The wounding of tissues was followed by a rise of temperature which was greatest immediately at the wounded surface. The duration of this phenomenon varied between one-half and 3 days, the elevation of temperature ranging from 0.02 to 0.08° C. with an average of about 0.04°. The maximum elevation was reached on an average in 1 hour after wounding (in extreme cases from 15 minutes to 3 hours thereafter). The details of the phenomenon were found to vary for different classes of objects studied. Objects of the same kind under conditions exactly alike exhibited individual differences as regards heat response to wounding, while halves of the same object invariably showed no differences in this respect.

Arsenic in some parasitic or parasitized plants, F. JADIN and A. ASTRUC (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 4, pp. 291–293*).—The results of the authors' analyses, carried out with 19 parasitic and 12 host plants, are considered to justify the following conclusions:

Parasitic plants on hosts growing directly in the soil contain normally a certain quantity of arsenic. Mistletoe, though found growing in unlike regions and on very different kinds of trees, uniformly contains practically the same proportion of arsenic, although the host plants may show an appreciable difference in this respect. It has not been found possible to establish a proportion between the arsenic content of the parasite and that of its host.

Some quantitative determinations of manganese in plants, F. JADIN and A. ASTRUC (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 6, pp. 406–408*).—Continuing the above studies, the authors present their findings as to manganese.

They find this constantly present in plants, thus explaining wholly or in part the origin of this element in the animal organism. The chlorophyll-bearing parts of the plant appear to have more manganese than the underground portions. In case of a plant rich in chlorophyll, such as mistletoe, manganese was found to vary greatly from causes not yet ascertained.

Variations in the proportion of nicotin in different organs of the tobacco plant during its vegetative period, E. CHUARD and R. MELLET (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 4, pp. 293–295*).—Analyses were made of leaves, stems, roots, suckers, and buds of tobacco plants taken on July 14, August 9, September 18, and November 4.

It was found that the nicotin content in the leaves, stems, and roots increased rapidly during the first period; that in leaves increased little during the second and not at all during the third period; while in stems and roots it declined steadily after August 9. In the shoots it reached a maximum September 18. In the tips it did not increase after July 14.

The influence of tobacco smoke on plants, H. MOLISCH (*Sitzber. K. Akad. Wiss. [Vienna], Math. Naturw. Kl., 120 (1911), I, No. 7, pp. 813–838, figs. 4*).—Continuing work previously noted (E. S. R., 27, p. 254), the author reports more fully on the effects of tobacco smoke on plants, as follows:

Micro-organisms were quickly injured or killed by tobacco smoke. Plants showed great differences in their mode of reaction thereto. *Tradescantia guianensis, Selaginella martensii, Tolmiea menziesii, Eupatorium adenophorum*, species of Echeveria, etc., suffered little injury or check from tobacco fumes of

moderate density. On the other hand, some showed themselves very sensitive either (1) by chemotactic movements, as *Bœhmeria utilis*, *B. polystachya*, *Impatiens parviflora*, and *Parietaria officinalis;* (2) by anomalous development of lenticels, as *Goldfussia glomerata*, *Salix rubra*, and *Sambucus nigra;* (3) by fall of leaves, as in case of *Mimosa pudica* and others; or (4) by limitation of anthocyanin-formation in *Strobilanthes dyerianus*.

A case of chronic poisoning of fruit trees by factory smoke, R. NASINI, G. CUBONI, and O. MATTIROLO (*Perizia Giudiziaria. Torino, 1911, pp. 82+3; rev. in Internat. Inst. Agr.* [*Rome*], *Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 4, pp. 1045–1049*).—This is a study of the cumulative effects on the sweet orange (*Citrus sinensis*) of poisoning by sulphur dioxid in factory smoke. Details of the injuries are given, also recommendations for the protection of the trees.

FIELD CROPS.

The Woburn field experiments, 1910, J. A. VOELCKER (*Jour. Roy. Agr. Soc. England, 71 (1910), pp. 322–343*).—This continues work previously noted (E. S. R., 23, p. 632). The season of 1910 was unfavorable, the land wet and cold, and germination much delayed.

On the plats on which wheat and barley have been grown continuously the thirty-fourth year's yields on the check plat averaged 14.1 and 13.5 bu. per acre, respectively, as compared with 25.1 and 11.7 bu. after rape dust equivalent to 25 lbs. of ammonia; 24.1 and 20.3 bu. after mineral manures and sulphate of ammonia equivalent to 25 lbs. of ammonia on the plats to which 1 ton of lime had been added in 1905; and 27.8 and 31.5 bu. after mineral fertilizers and nitrate of soda equivalent to 50 lbs. of ammonia.

In rotation tests, the plat of swedes fed off by sheep that received decorticated cotton cake in addition produced a little more barley than the check plats, but the plat on which sheep were fed corn meal produced the lowest barley yield in this portion of the test. When cattle were similarly fed, there was little difference in yield on the cotton cake and corn meal plats, but each produced 4 or 5 bu. more than the check plats. In another rotation, the wheat yield following mustard during the fourth year after the cotton cake and corn meal had been fed on the land indicated that the residual effects of the manure had been practically exhausted by this time. With a third rotation, using sheep the yield of swedes after wheat was somewhat lower on the corn and cotton cake plats than on the check plats, but with cattle the swede yield was about 2½ tons per acre greater on the cotton cake plat than on the check plats, while the corn-meal manure apparently gave no profit. In a fourth rotation, mustard after barley gave a lower average yield on the corn meal and cotton cake plats than on the check plats.

Mustard and rape plowed under as green manures were followed by much higher wheat yields than were vetches and each of the three was followed by a considerably higher yield when plowed under with lime than with mineral manures. This difference in favor of lime had not been noted in the earlier years of this test and may be due to the depletion of the lime content of the soil. The indication of the superiority of mustard as green manure, however, is in harmony with the results of earlier experiments.

In 1910, as in each of the 4 previous years of the test, a Canadian alfalfa seed gave markedly higher yields than did two other varieties designated as Provence and American.

An application of 2 tons of lime was followed by a yield of 38.1 bu. of wheat as compared with 37 bu. on the no-lime plat, and 42.1 bu. on the plat which received 10 cwt. of ground lime in 1907 and the same amount in 1909.

In a test of nitrogen sources for oats, each applied in quantities supplying the amount of nitrogen contained in 1 cwt. of sulphate of ammonia, a wheat yield of 1,916 lbs. was obtained after the use of calcium cyanamid; 1,812 lbs. after calcium nitrate; 1,779 lbs. after nitrate of soda; and 1,771 lbs. after sulphate of ammonia, as compared with 1,572 lbs. on the check plat.

In another test of nitrogen sources, each applied in amounts supplying the same amount of nitrogen as that contained in 1 cwt. sulphate of ammonia, and each accompanied by a so-called standard dressing consisting of 12 tons of dung, 3 cwt. of superphosphate, 1 cwt. sulphate of potash, and 2 cwt. salt, a yield of 29 tons 3¾ cwt. of mangels was secured after the use of sulphate of ammonia, 34 tons, 15 cwt. after nitrate of soda, 36 tons 16⅞ cwt. after calcium nitrate, 35 tons 15⅝ cwt. after calcium cyanamid, and 33 tons after soot. From this test the author concludes that calcium cyanamid and calcium nitrate appear to equal or excel nitrate of soda as fertilizers for mangels. The planting of mangels on plats to which these nitrogen sources had been applied the previous year indicated "that the residue left over for a second crop was in no instance of material value."

In a test of 10 wheat varieties, the Dutch variety Wilhelmina produced a much higher yield than any other tested but was poor in strength, while Red Admiral produced a much higher yield than any other English or French variety tested. Two Cambridge varieties designated as No. 1 and No. 2 excelled the others in quality but No. 2 was the lowest yielding variety tested.

In a meadow fertilizer test an application of 10 cwt. of basic slag and 1 cwt. of sulphate of potash per acre was followed by a yield of 1 ton, 15¾ cwt. of hay per acre as compared with 1 ton, 18¼ cwt. after 12 tons of farmyard manure and smaller yields after other mixtures of superphosphate, basic slag, nitrate of potash, and sulphate of potash in various mixtures. The hay containing the highest percentage of legumes and the lowest percentage of grasses followed an application of superphosphate and sulphate of potash, while the lowest percentage of legumes and the highest percentage of grasses was obtained from the no-manure plat.

The Woburn field experiments, 1911, J. A. Voelcker (*Jour. Roy. Agr. Soc. England, 72 (1911), pp. 387–403*).—This continues the work noted above. The prolonged drought of 1911 was especially severe on the grain crops on this light sandy soil.

On the plats on which wheat and barley have been grown continuously, the thirty-fifth year's yields of these 2 crops on the check plats averaged 8.2 and 2.6 bu. per acre, respectively, as compared with 20.2 and 26.7 bu. after farmyard manure equivalent to 100 lbs. of ammonia; 21.8 and 3.8 bu. after nitrate of soda equivalent to 50 lbs. of ammonia; 21.6 and 1.7 bu. after half this amount of nitrate of soda; and 20.2 and 6.2 bu. after 1 cwt. of sulphate of potash and nitrate of soda equivalent to 25 lbs. of ammonia. On the wheat plats an application of sulphate of ammonia equivalent to 25 lbs. of ammonia was followed by a yield of 1.4 bu. as compared with 19.1 bu. after the same amount of sulphate of ammonia supplemented by 5 cwt. of lime in January 1905, repeated in 1909 and 1910. These same fertilizers, and superphosphate and rape dust singly and in various mixtures and amounts were also applied to 14 other plats.

A higher yield of grain and straw was obtained from a wheat plat fertilized with the manure from corn-fed cattle than in case of the check plats or a plat fertilized with the manure from cattle fed on decorticated cotton cake. On land on which the previous year's swede crop had been consumed by sheep which were fed corn on the plats, the wheat yield was 2 cwt. and the straw yield over 3¼ cwt. greater than on the plat where the swede crop had been

consumed by cake-fed sheep. The cake-fed sheep received chaff and equal parts of linseed and undecorticated cotton cake, while the grain-fed sheep received chaff and equal parts of barley and oats in addition to the swedes.

In a test of nitrogenous top dressings supplying the amount of nitrogen contained in 1 cwt. of sulphate of ammonia, a wheat yield of 1,240 lbs. followed nitrate of soda as compared with 1,026 lbs. after nitrate of lime, 1,016 lbs. on the check plat, 959 lbs. after sulphate of ammonia, 1,061 lbs. after calcium cyanamid, 1,174 lbs. after a mixture of equal parts of nitrate of lime and cyanamid, and 1,078 lbs. after a mixture of one part of nitrate of lime and two parts of cyanamid. The author regards the mixing of these two materials as distinctly satisfactory.

In a test of alfalfa varieties designated as American (Arizona), North American, Canadian, Turkestan, Provence, Russian (Europe), and Russian (Asia), "the two that stood out undoubtedly the best were the two American varieties."

The cost per acre of hoeing, thinning, and harvesting sugar beets planted 12, 15, and 18 in. apart was 86s. 6d., 70s. 6d., and 58s., respectively, as compared with 24s. 6d. in case of mangels planted 24 in. apart. The yields in the same order were 21 tons 1 cwt., 22 tons 13 cwt., 23 tons 15 cwt., and 44 tons 4 cwt.

Although the conclusions are deemed only tentative, it appeared that Buxton lime and chalk lime excelled lias, oolite, and magnesian limes for grass.

Report of Hedemarken County Experiment Station, 1911, W. CHRISTIE (*Ber. Hedemarkens Amts Forsöksstat. Virks., 7 (1911), pp. 56, pls. 2, figs. 2*).—Tests of potato varieties, planting potatoes of different degrees of maturity, fall growth of potatoes, and changes occurring after harvest, dates of sowing winter rye, and the use of Thomas phosphate, nitrate of soda, and kainit as top-dressing for meadows are included in this report. The work on meadows and winter rye has extended over a period of years.

[Field crops at the Roseworthy Agricultural College], A. J. PERKINS and W. J. SPAFFORD (*Jour. Dept. Agr. So. Aust., 14 (1911), Nos. 10, pp. 959–967; 11, pp. 1030–1037; 12, pp. 1141–1154; 15 (1911), Nos. 1, pp. 10–25; 2, pp. 112–119*).—This is the fourth report (E. S. R., 23, p. 535). Meteorological data and a general discussion of 6 years' results are followed by a statement of the results obtained in 1909–10 and 1910–11.

Rotation tests were conducted to determine whether or not local farming was possible except under the bare fallowing system now practiced. When wheat was grown continuously the yield fell from 29 bu. 19 lbs. per acre the first year to 9 bu. 15 lbs. the second year, and 3 bu. 53 lbs. the third year. In the second and third years these yields were 11 and 12 bu., respectively, below the averages of those secured after bare fallow. The hay yields were about a ton below the averages on the bare fallow plats during each of the 2 years. In a 2 years' test comparing bare fallow with (1) a turnip, barley, pea, wheat, and (2) a kale, oat, vetch, wheat rotation, the advantage in grain yield on the bare fallow was more than sufficient to pay the rental costs of idle land. During other years this difference was insufficient, and in one case the difference was nearly 3 bu. in favor of wheat grown in rotation. In hay yields the wheat grown in rotation averaged much better than that grown after bare fallow. In another rotation the returns of wheat after sorghum did not approach those secured from wheat after bare fallow. The authors conclude that under the conditions during these tests a year of bare fallow is not essential in growing wheat for either hay or grain.

In the turnip, barley, pea, wheat, rotation during 4 years, the turnips maintained the equivalent of 3.16 sheep per acre for an entire year. Similarly an

acre of barley maintained 0.94 sheep per acre per year, peas, 2.26, and wheat 0.39. In the kale, oat, vetch, wheat rotation the figures were 2.41, 0.59, 2.69 and 0.52 sheep per acre per year, respectively. The total gross returns for the two 4-year rotations were £12 4s. 1d. and £12 13s. 5d., respectively, as compared with £10 15s. after bare fallow. The increased gross return was not sufficient to cover the additional outlay involved in raising the subsidiary crops.

Three years' work indicated that in point of cereal returns a bare-fallow, wheat rotation had every advantage over a bare fallow, wheat, pasture rotation, although the net returns from the longer rotation "are likely to be quite as good if not better."

Four years' tests indicated that the average sheep-carrying capacity of pasture plats after wheat, treated with ½ cwt. of superphosphate, was 2.66 sheep per acre per year, as compared with 3.01, 3.09, and 3.26 head, respectively, in case of plats that received 1, 2, and 3 cwt. of superphosphate per acre. These heavier applications apparently gave a carrying capacity about 4 or 5 times as great as that "of similar land worked on ordinary station lines." In case of wheat, the heavier applications of superphosphate did not produce profitable increases in yield.

On unfertilized plats the period between germination of wheat and full bloom averaged 135 days and that between germination and ripening 180 days, as compared with 130 and 178 days on the superphosphate plats, and 126 and 173 days on the nitrate of soda plats. Although nitrate of soda apparently increased the grain and hay yields, the increases were insufficient to pay the cost of the fertilizer.

In a 5-year test applications of 2 cwt. of superphosphate either with or without ¼ cwt. of nitrate of soda to wheat were followed by somewhat greater grain yields than were 2 or 3 cwt. of basic slag or 14 tons of farmyard manure per acre. In a 1-year test of fertilizers after bare fallow a higher wheat yield followed an application of 2 cwt. of superphosphate and ½ cwt. of sulphate of potash than was secured on any of 14 other plats in the test, which received applications of superphosphate with or without sulphate of potash, sulphate of ammonia, nitrate of soda, or muriate of potash in various mixtures and amounts. Eleven of these plats had been seeded continuously to wheat and decreased in average yield from 26 bu. 10 lbs. in 1905 to 5 bu. 23 lbs. per acre in 1907. In 1908 they were bare fallowed and in 1909 averaged 35 bu. and 34 lbs. of grain per acre.

[Small grain experiments at the Roseworthy Agricultural College], A. J. Perkins (*Jour. Dept. Agr. So. Aust., 15 (1912), Nos. 7, pp. 705–713; 8, pp. 792–800*).—These pages state the results of variety tests of oats, wheat, and barley on six 1-acre plats plowed from 2 to 12 in. The highest wheat yield was obtained from the plat plowed 8 in. deep.

[Depth of sowing tests], A. J. Perkins and W. J. Spafford (*Jour. Dept. Agr. So. Aust., 15 (1911), Nos. 3, pp. 208–216; 4, pp. 353–362; 5, pp. 479–498; 15 (1912), No. 6, pp. 608–623, fig. 1*).—Tables state in detail the germination secured by sowing at 12 different depths ranging from ½ in. to 6 in. during the 3-year period, 1906–1909. The seeds were generally planted on duplicate plats in sandy soil and in a heavy clay loam, and not all were sown throughout the 3-year period.

Wheat germinated most freely in sandy soil when sown from ½ in. to 1 in. deep, and fairly satisfactorily up to 4 in. but beyond that depth germination was irregular, although 50 per cent of the plants finally came up even after sowings 6 in. deep. In heavy clay loam, germination was best at a depth of 1 in. but continued fairly satisfactory to a depth of 2½ in., while below 4½ in. more than 50 per cent was lost.

In light sandy soil from 1½ to 2½ in. appeared to be the best depth for sowing barley, although satisfactory results were obtained at depths of 4 in. beyond which a greater proportion of the plants died back. In heavy clay loam from ½ to 2½ in. appeared to be the normal depth of planting, and the highest yields of grain were secured from sowings between 1 and 2 in. deep.

Oats in light sandy soil germinated best at depths between 1½ and 2½ in., but might be planted 4 in. deep without much danger of serious loss from faulty germination. About three-fifths of the seed sown germinated successfully at a depth of 6 in. The germination of oats sown from 1½ to 2½ in. deep took place between the tenth and thirtieth days after sowing, as compared with the ninth and eighteenth days for barley, and the tenth and twenty-first days for wheat sown at similar depths. In heavy clay loam from 1½ to 2 in. appeared to be the best depth of sowing for oats, but fully three-fourths of the seed sown 5½ in. deep germinated successfully. The proportion of plants dying back increased steadily at depths greater than 4 in.

One year's tests indicate that on sandy soil field beans and peas will give a germination of from 90 to 100 per cent at all depths between ½ in. and 6 in.

From 2 years' work it was not possible to state in figures a depth of planting corn that would be applicable to all cases. Shallow planting appeared likely to result in late and irregular germination depending almost entirely upon the rains following planting.

For sorghum about 1 in. appeared to be the best depth of sowing if sufficient moisture in the surface soil layer could be relied upon. Under ordinary circumstances, however, sowing from 1 to 2 in. deep in heavy soils or from 2 to 2½ in. deep in light soils, and in case of late seeding even deeper sowings, are recommended. Millet should not be sown more than 1 in. deep on heavy land or 1½ in. on light soil.

[Fertilizer tests on meadows], G. Bredemann (*Fühling's Landw. Ztg., 61 (1912), Nos. 5, pp. 166–191; 6, pp. 210–229*).—A brief summary of earlier work is followed by statements of the results of fertilizer tests on meadows extending over a considerable period of years at each of a number of German experiment stations. The fertilizer mixtures applied were (1) Thomas meal and kainit; (2) Thomas meal, kainit, and every fourth year quicklime, and (3) Thomas meal, kainit, and every fourth year a double application of quicklime. Mechanical and chemical analyses of the soils of each of the stations are given.

Cooperative experiments with alfalfa, M. F. Miller and C. B. Hutchison (*Missouri Sta. Bul. 106, pp. 23–56, figs. 8*).—The experiments here reported, begun in 1907, were increased in number from year to year and finally furnished data from 74 of the 114 counties of the State. Each cooperator was instructed to devote 1 acre to the test and to divide this into 4 equal plats. The first plat was to receive 12 tons of manure per acre, the second 3,000 lbs. of lime, the third 300 lbs. of steamed bone meal, and the fourth was to receive no soil treatment. Two-thirds of each plat was to be inoculated and one-half of the inoculated portion given cultivation with a disk or spring-tooth harrow. The results of the individual experiments as well as summaries based on the soil types and the soil treatment are given in tables and discussed.

The data secured in this cooperative work indicated that alfalfa does not have as wide adaptations as most forage crops grown in the State. The most important factors in the success of the crop were drainage, the character of the subsoil, the fertility, and the quantity of lime carbonate present. The well-drained silt and sandy loam bottom lands with porous subsoils proved to be the best alfalfa lands of the State. On upland soils the best results were secured on the fertile, rolling prairies of the north and west central part, the

better timbered lands of north Missouri, and the more fertile valley lands of the Ozark region. The number of failures was largest on the level prairie lands.

The application of manure was found beneficial and often necessary in securing a satisfactory stand on most upland soils. The use of bone meal on the upland soils, which are mostly lacking in available phosphates, appeared profitable. Most of the soils of the State adapted to alfalfa growing are well supplied with lime carbonate and hence lime did not usually give profitable returns. In most cases inoculation of the soil was found beneficial or necessary, and cultivation of the crop with the disk or spring-tooth harrow was found effective in preventing the growth of grasses during late summer.

Alfalfa seed production, R. W. THATCHER (*Washington Sta. Popular Bul. 42, pp. 4*).—Cooperative work of the station and this Department in the production of alfalfa seed is briefly reported.

Thinning experiments carried on in this connection showed conclusively that a much better yield of seed may be obtained from a thin than from a dense stand of alfalfa, but the work is to be continued. From the results of some of the experiments, as well as observations made in another connection, it appears probable that with proper thinning large crops of seed may be secured.

The development of the grain of barley, WINIFRED E. BRENCHLEY (*Ann. Bot.* [*London*], *26* (*1912*), *No. 103, pp. 903–928, figs. 22*).—Pursuant to previous studies on the development of the grain in wheat (E. S. R., 24, p. 37), the author investigated samples of barley from plants so selected as to show the results obtained (1) from a nitrogenous general manuring, (2) a rotation without any addition of manure, and (3) phosphoric acid starvation in the presence of a sufficiency of nitrogen and of potash and other alkalis. The results may be summarized as follows:

The weight of the plant as a whole, also of the nitrogen, phosphoric acid, and ash, increase until desiccation begins about 3 weeks before harvest. After this the ash decreases somewhat, while the nitrogen and phosphoric acid continue fairly constant. The phosphoric acid-starved plat, in case of barley, showed somewhat abnormal results, especially in the analysis of the straw. During the longer desiccation period of barley certain maturation changes are evident which are hardly noticeable in wheat, which is cut earlier in its development. The infiltration of starch progresses from the chalazal end toward the embryo. As the barley grain develops, nuclear changes appear, thought to be due to pressure from increase of starch. The nuclei lose their nucleoli and become deformed progressively from both ends of the grain toward the middle, the last cells involved being those of the subaleuronic layer of the endosperm.

[Clover tests in Denmark], E. LINDHARD (*Tidsskr. Landbr. Planteavl, 19* (*1912*), *No. 1, pp. 1–43*).—The experiments reported include variety and rate of seeding tests conducted at Danish experiment stations with alsike clover, white clover, yellow trefoil, and kidney vetch. Seed grown in various counties was also tested.

Increasing the yield of a strain of Reid yellow dent, J. R. HALL (*Col. Farmer* [*Univ. Missouri*], *9* (*1912*), *No. 4, pp. 7, 8, fig. 1*).—The author summarizes some results of Williams and Welton already noted (E. S. R., 23, p. 37).

From his own experiments he concludes that it is impossible to detect the highest yielding ears of seed corn by inspection, but he states some indications of high yielding power. In a 2 years' test the ears over 9 in. averaged 3.68 bu. higher yields than those under 9 in. in length. Cylindrical ears yielded 1.5 bu. per acre more than tapering ears, moderately smooth ears yielded 4.87 bu.

more than moderately rough ears, and heavy ears showed an average advantage of 3.9 bu.

Mendelian inheritance in cotton hybrids, C. A. McLendon (*Georgia Sta. Bul. 99, pp. 139–228, figs. 27*).—This bulletin is a report of progress on experiments in cotton breeding conducted for 3 years and including only the second generation of the first crosses made.

The varieties and types entering into this work were Willet Redleaf, Cook Bigboll, Hastings Bigboll, Pride of Georgia, Toole, Sistrunk, Russell Bigboll, Cleveland Bigboll, Ratteree Favorite, Blue Ribbon, and Sea Island. From a trial plat planted with commercial seed of the different varieties the parent stock was selected on the basis of superiority and general appearance. Several series of crosses were made in each instance and when the progeny of the parent plants and the F_1 generation of the crosses were grown, all of the series except those from parents showing their purity were eliminated. Six series of crosses were made the first year and 3 additional series the second between varieties of tested purity. The methods employed are described in detail, particular attention being given to crossing and selfing. The inheritance of characters is discussed and tables are given showing the dominant and recessive characters, together with the ratio of segregation. A list of 37 allelomorphic pairs of unit characters in the cotton plant is presented and a bibliography of 28 references on Mendelian inheritance and natural crossing in cotton is appended.

The results of 2 experiments conducted on a limited scale showed that natural crossing occurs, but that most if not all insects causing it may be excluded from the plants by means of netting.

It is concluded from the results secured that the heritable characters in the crosses studied seem to obey Mendel's laws of dominance, segregation, and recombination. Dominance was found incomplete for several characters which rendered the heterozygote intermediate and gave a greater range of visible variation in crosses having two or more characters correlated. Segregation into the 1:2:1, 3:1, 9:3:3:1, and 15:1 ratios was indicated in these experiments, but the exact theoretical proportions occurred in only a few instances, this being considered due either to the small number of individuals or the heterozygous condition of the parent stock. Intensification of the characters in crosses between Sea Island and Upland varieties was very common in the F_1 generation, but in the succeeding generations it gradually diminished. Fluctuation was infrequent in pure strains but very common in lint characters, even in apparently homozygous individuals. Variations of economic importance were of frequent occurrence, but they were usually if not always the result of crossing.

Fertilizer tests of oats, F. Gaul (*Illus. Landw. Ztg., 32 (1912), No. 10, pp. 75, 76*).—Tables report the results of a number of years' tests of ammonium sulphate, nitrate of soda, nitrate of lime, Thomas meal, and kainit singly or in various mixtures as fertilizers for oats in Thuringia.

From the data presented the author concludes that on light dry soil, ammonium sulphate harrowed in at the time of planting proved the best nitrogen fertilizer for oats. Thomas meal and kainit gave no profits when applied to oats after winter grain, but may be used when oats are a nurse crop for clover. Kainit and a 40 per cent potash salt may be used on a heavy soil that tends to the formation of a crust.

The influence of different amounts of water on the yield and quality of sugar beets, A. Herke (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 41 (1912), No. 1, pp. 1–7*).—Analyses of beets grown in concrete and other pots, to which water was applied at 3 different rates each year, are reported in tabular form. Parallel series of experiments were conducted on 3 different soils.

Other tables report the amount of water used per kilogram of plant substance produced by the plants.

The total nitrogen content in the roots decreased as the amount of water applied increased, but probably no less nitrogen was absorbed by the large heavily watered beets, as the nitrogen rose to the foliage in this case. The decrease in the total nitrogen content was even more rapid than the increase in the amount of water applied, and the quality of the beets was improved. This is in harmony with the common observation that during dry seasons the injurious nitrogen content is high.

The composition of sugar beets of different sizes, A. HERKE (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 41 (1912), No. 1, pp. 8–12*).—Each of a number of lots of beets was sorted, on the basis of weight, into 3 groups. Tables show the chemical composition of the beets in each group.

Soaking beet seed, G. KÖCK (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 41 (1912), No. 1, pp. 13–15*).—Soaking beet seed 20 hours in pure water gave a quicker, more even germination, healthier and more vigorous plants, and heavier beets. The results of treating with 0.5 per cent carbolic acid are also briefly reported.

The germination of hulled timothy seed, B. KAJAMUS (*Fühling's Landw. Ztg., 60 (1911), No. 12, pp. 431–434*).—Tests of 19 samples grown during the year preceding the test showed an average germinating power of 93 per cent for the seed without hulls, and 97.5 per cent for that with hulls. In case of a poorly stored sample the tests were 61.3 and 64.3 per cent, respectively. This seed was probably immature. In another group the author includes 6 samples in which the seed with and without hulls showed average germination tests of 79.5 and 42.9 per cent, respectively. He concludes that storage affects more quickly the seeds which have lost their hulls, and that they are more subject to mold. Their metabolic processes are hastened and the germ dies more quickly.

Tobacco: Breeding cigar filler in Ohio, A. D. SELBY and T. HOUSER (*Ohio Sta. Bul. 239, pp. 361–479, figs. 30*).—This bulletin, continuing previous work (E. S. R., 27, p. 237), states the conditions surrounding tobacco improvement in the Ohio tobacco filler district, and records the results in producing new types by selection and hybridization at the Germantown test farm in cooperation with the Bureau of Plant Industry of this Department. The theory and practice of hybridization and tobacco breeding are discussed in detail and the more important hybrids originated in this work are described.

The selection of individual seed plants of Zimmer Spanish resulted in no progress toward a better quality or a higher yield, and indicated that improvement was possible only by the method of crossing followed by selection. In 1906, plants from seed 15 years old and which germinated nearly as well as new seed did not differ in character or yielding capacity from other Zimmer Spanish tobacco grown. In 1910, old seed claimed to have passed through but 2 generations since the original supply had been obtained from the supposed originator of the variety, produced less than the checks grown with it, and the tobacco again appeared exactly like the ordinary Zimmer Spanish of to-day. These results are believed to disprove the claim that the variety is running out.

Results obtained in 4 different years with Connecticut Havana led to the conclusion that this variety is identical with Zimmer Spanish. These results were also regarded as showing a remarkable fixity of type in which even radical changes of environment do not produce inheritable variation.

In 1906, Ohio Seedleaf and Pennsylvania Seedleaf in a comparative test yielded 44.6 and 40.6 per cent more respectively than Zimmer Spanish. For the 4 years 1907–1910, selections of Pennsylvania Seedleaf, numbered 9 and 12, pro-

duced an average gain per acre over Zimmer Spanish of 428 lbs., or 43.9 per cent, and 482 lbs., or 52.1 per cent, respectively.

Experiments with the Cuban variety indicated that considerable improvement in yield and in the reduction of suckers is possible through selection. By this means, the yield was increased from slightly over one-half to more than three-fourths of the yield of Zimmer Spanish. As the yielding capacity of the variety is so low, no practical results were obtained. Under the conditions existing in the Miami Valley district, this variety undergoes a marked breaking up in type, but the range in variation was not found so great as in hybrids between radically different varieties.

Hybridization work was begun at Germantown in 1903 by making 26 distinct crosses between Connecticut Seedleaf and Cuban varieties. In 1904, crosses were made between these first hybrids and Ohio Seedleaf and Zimmer Spanish, together with one each between Zimmer Spanish and Ohio Seedleaf and Zimmer Spanish and Cuban. The next year a large number of crosses were made between Cuban, Zimmer Spanish, Ohio Seedleaf, and several hybrids already made in divers combinations. Since that time, new hybrids have been made each year, among them a number whose parents were both of Seedleaf type.

The hybrids are arranged in 4 groups of which the first includes the Havana or Spanish types, more or less closely approaching Zimmer Spanish, the second contains the Seedleaf class, the third those intermediate between Seedleaf and Spanish, and the fourth the Cuban and Connecticut Seedleaf hybrids. Of the 26 hybrids between Cuban and Connecticut Seedleaf made in 1903, only 5 were retained as worthy of propagation. The variation in this lot of hybrids was extreme, and in the second generation it was so great that no 2 plants of sufficient individual merit to warrant propagation bore any considerable resemblance to each other.

The individual annual records of the important members of each group of hybrids are summarized in tables. A comparison of yields of 24 hybrids and 8 varieties presented a general increase in the relative yields of the hybrids during the 3 years 1908–1910. The average increase per acre over Zimmer Spanish for all hybrids in 1908 was 189 lbs., in 1909 227 lbs., and in 1910 405 lbs.

Experiments to determine the possibility of growing tobacco crops as first-generation hybrids were carried on during several seasons. Zimmer Spanish was selected for determining the effects of cross-fertilization within the limits of a fixed variety. The average of all results gave a gain of only about 25 lbs. per acre in favor of cross-fertilization. The lack of variation in Zimmer Spanish, or its fixity of type, is given as a possible explanation of this result. In 1907, pairs of plants of distinct varieties were selected and 2 lots of seed from each plant, one arising from self and the other from cross-fertilization, were secured. The results of this seed from 8 plantings for each pair of parent plants showed that in all cases the hybrids exceeded in yield not only the average of their parents but also their more productive parents. The minimum increase per acre was 67 lbs., while the maximum was 285 lbs., and the average 165 lbs. In 1909, 39 new hybrids were tested in a similar way with their parent plants. These hybrids, in most cases produced considerably more than the parental average, but a number of them failed to reach the yield made by the more productive parent. This year the hybrid yields ranged from a minimum of a decrease per acre of 160 lbs. to a maximum of an increase of 492 lbs., the average of the hybrids being about 185 lbs. greater per acre than that of their parent plants. In discussing the relation of parental yields to that of hybrids, the authors state that in many instances they have been able to produce in the third and later generations yields much in excess of the yield of the first gen-

eration. They report their failure to produce a first-generation yield equal to the combined yield of both parents, which was accomplished several times in later generations. In reviewing the possibility of producing first-generation hybrids on a commercial scale, it is estimated that the extra cost should not exceed 50 cts. per acre.

A study of certain strains of some of the hybrid varieties indicated the possibility of breeding for special adaptations. Among the hybrids produced some exhibited great drought resistance and others a much greater ability to make profitable use of the less available or more slowly available forms of plant food such as barnyard manure or other forms of organic matter and certain ingredients often found in commercial fertilizers.

Cooperative tests by farmers were conducted in 1909, 1910, and 1911. In 1910, Hybrid 81 was given out for the first time and immediately found favor with many growers on account of its erect habit of growth, hardiness, and great ability to withstand windstorms. In yield it made from 13 to 46 per cent more than Zimmer Spanish under the same conditions. The cured tobacco of this hybrid is almost undistinguishable from that of Zimmer Spanish, and its smoking quality has proved equal to or better than that of Zimmer Spanish. It is stated that the total number of cooperative growers for 1912 is about 100 and that the total acreage of hybrids to be grown in these tests will amount to over 250 acres planted largely to Hybrids 81, 224, and 199. Hybrids 81 and 224 of the Spanish types, Hybrid 199, a Seedleaf type, and Hybrid 110, which is intermediate in character, are especially recommended for trial.

Smoking tests of Ohio filler tobacco are reported and discussed. It was found that there was no apparent connection between nicotin content and smoking quality.

The influence of superphosphates on the germination of wheat, A. J. EWART (*Jour. Dept. Agr. Victoria, 10 (1912), No. 4, pp. 256–258*).—The author notes that it has frequently been stated that the germination of wheat may be easily affected if it lies long in contact with superphosphate of lime in a dry soil. The injury is pronounced only when the seed germinates and the soil subsequently dries.

Seeds stored dry with an equal quantity of dry superphosphate gave germination tests averaging 91.25 per cent at the end of 3 weeks, and 87 per cent at the end of 6 weeks, as compared with 91 per cent at the end of 3 weeks in case of the seed stored without superphosphate. The author concludes that little or no injurious effect is exercised under these conditions in a moderate length of time.

In a field test, superphosphate was applied with the grain 1 in. deep, 1 in. below the seed and 3 in. below the seed. The deeper plantings were invariably followed by considerably greater yields.

Wheat experiments, season 1911, H. ROSS ET AL. (*Agr. Gaz. N. S. Wales, 23 (1912), No. 4, pp. 277–293*).—These pages report the results of farmers' variety tests of wheat in 4 different districts, fertilizer and smut prevention tests, and trials of mixed sowings of wheat and oats for hay.

Seed laboratory report for 1910 and 1911, W. L. OSWALD (*Minnesota Sta. Bul. 127, pp. 129–163, pls. 2, figs. 12*).—Following introductory remarks on the objects of the Minnesota seed laboratory by E. M. Freeman, the bulletin describes methods of seed testing employed, reports the source of the seed samples received, presents results of purity and germination tests, and describes a weed-seed case for the identification of weed seeds.

During the 2 years, 2,275 tests for purity were made. It was found in this work that out of a total of 59 different weed seeds found, 36 occurred in the different samples of medium red clover. Only 4 different varieties were found

in rye. The seeds of lamb's quarters and pepper grass appeared in 14 of the 16 crop seeds examined, while dodder seed appeared only in alfalfa and red clover. Green foxtail and lamb's quarters were the most common weed seeds found. Of the millet samples examined, 96.2 per cent contained green foxtail seed. A large number of all samples tested were below the standard of purity.

On the average, all germination tests gave a higher average in 1911 than in 1910. Brome grass had a very low percentage of germination. The average germination of hard seeds in alfalfa was 16.125 per cent, in medium red clover 10.45 per cent, in mammoth clover 6.5 per cent, in white clover 19.41 per cent, and in alsike clover 12.55 per cent. Some tests of alfalfa at the laboratory showed from 50 to 75 per cent of hard seeds.

The approximate number of various crop and weed seeds per pound was determined and is reported in tables.

[Seed analyses and experiment station results], F. G. STEBLER (*Landw. Jahrb. Schweiz, 25 (1911), No. 5, pp. 149–170*).—These pages report the results of purity and germination tests of the seeds of legumes, grasses, grains, fiber crops, root crops, and forest trees at the Zurich Seed Control Station. They also give a brief report of other work under way (E. S. R., p. 239).

Period of germinability of the seed of Cuscuta epilinum, A. HERZOG (*Deut. Landw. Presse, 39 (1912), No. 27, p. 321, figs. 3*).—A table containing the results of annual germination tests of the seed of *C. epilinum*, conducted during the period 1897–1911, indicates that the percentage of the seed which germinated in the first 5 days of the test gradually decreased from 90 in 1897 to 4 in 1906, and that the seed appeared to be entirely dead during 1910–11.

HORTICULTURE.

Report of the horticulturist, C. F. KINMAN (*Porto Rico Sta. Rpt. 1911, pp. 24–27, pls. 3*).—A progress report of the year's work with fruits, vegetables, and miscellaneous plants (E. S. R., 25, p. 740).

In the cooperative fertilizer experiments with citrus fruits the complete fertilizers continued to give the best results. A study of the navel oranges growing in Porto Rico indicates that there is a great variation in regard to the quality of the fruit. Material has been collected from different orchards on the island and experiments to determine the cause of variation in quality are under way. The evidence in some cases indicates that this difference is due to bud variation.

Experiments in fumigating young pineapple plants taken from fields badly infested with mealy bugs have shown that a fumigation strong enough to assure clean plants at setting without injury to the plants can be made. The fumigation, however, has only a temporary effect and the customary practices must be employed in keeping the plants free from insects after they have been set in the field.

The work with cover crops in citrus orchards was extended to pineapple and coconut plantations. Cowpeas, velvet beans, sword beans, and pigeon peas have given good results. Cowpeas were found to be inferior to the other crops for summer planting on heavy soils as they mature early and often at a time when the soil is too wet for replanting or caring for a new crop properly. The other crops mentioned continue their growth throughout the season of heavy rains and make a dense cover that keeps down all the grass and weeds and also serves to prevent soil washing. Good crops of seed were secured from cowpeas planted in the spring, although winter-grown crops of Canavalia and velvet beans are more prolific. Canavalia and velvet beans planted on low, heavy

land April 10 yielded 12½ tons and 9 tons per acre of vines, green weight, respectively, 94 days from planting.

A study of the degenerating influence of Porto Rican conditions on a number of imported vegetable varieties started 2 years ago indicates that at least the okra and beans have degenerated both in vigor of the plants and productiveness. Cultural, fertilizer, and variety tests with yautias, dasheens, and yams were continued with good results. Of the yams Potato and Guinea seem to be the most promising in Porto Rico.

A test of several varieties of strawberries imported from the United States indicates that this fruit is poorly adapted to Porto Rican conditions. Of the eucalypts which are being tested in low, heavy lands, *Eucalyptus robusta*, *E. piperita*, and *E. tereticornis* have been the only varieties to make satisfactory growth.

A study of the imported varieties of bananas in the station's plantings shows that there are many duplicates due to the common names used in the countries from which they were sent. The work with mangoes was continued along previous lines.

Report of the government horticultural experimental fields in South Holland for 1911, C. H. Claassen et al. (*Verslag Rijkstuinbouwproefvelden Zuid-Holland, 1911, pp. 96, pls. 2*).—This is the usual report for 1911 on cooperative cultural, variety, fertilizer, and spraying experiments with fruits and vegetables conducted at different localities in South Holland (E. S. R., 25, p. 642).

Note on the dipping or warm bath method of forcing plants, S. T. Parkinson (*Jour. Southeast. Agr. Col. Wye, 1911, No. 20, pp. 361–366, pl. 1*).—Additional tests of the warm bath method of forcing plants (E. S. R., 25, p. 536) are reported. The results on the whole confirm those previously obtained.

The kitchen garden, L. Pichenaud (*Le Jardin Potager. Paris, 1912, pp. 234, figs. 89*).—A practical treatise on amateur and market gardening. Part 1 deals with the general principles of gardening, garden equipment, etc.; part 2 contains detailed cultural directions for various classes and kinds of vegetables; and part 3 comprises a working calendar for the year.

The production of mushrooms in quarries by the means of a pure culture obtained by a new process, G. Boyer (*Proc. Verb. Soc. Sci. Phys. et Nat. Bordeaux, 1910–11, pp. 46–50*).—The author's method of producing pure mushroom spawn in a sterilized medium is described.

The effect of manganese on pineapple plants and the ripening of the pineapple fruit, E. V. Wilcox and W. P. Kelley (*Hawaii Sta. Bul. 28, pp. 20, pls. 2*).—The studies reported in this bulletin were undertaken in continuation of previous investigations relative to the effect of manganese on pineapples and of the chemical composition of pineapple fruits in different stages of development (E. S. R., 25, p. 340; 27, pp. 118, 129). In addition to the chemical investigations a microscopic study was made of all the different parts of pineapples for the purpose of learning the structural changes produced by the presence of large quantities of manganese in the soil and the morphological changes which occur in the ripening of the fruit. The authors call attention to the fact that anatomical and chemical findings are in striking harmony.

The root system of pineapples was found to be very variable and particularly sensitive to adverse soil conditions. In manganiferous soils the roots are less extensive and have characteristic swollen tips. These swellings seem to mark the cessation of the lateral growth of the roots, death and decay immediately following their development. The most conspicuous effect of manganese on the plant is seen in the bleaching of the chlorophyll, which first begins to fade, the chloroplasts lose their organized structure, after which the color disappears

altogether. Calcium oxalate is much more abundant in pineapple plants growing on manganiferous soils. The ash of such plants also contains considerably more lime and less phosphorus pentoxid and magnesia than when grown on normal soils.

The stem of pineapples serves as a repository for starch and contains large amounts of this substance. The leaves, in common with other members of Bromeliaceæ, contain several rows of palisade cells which contain nothing but cell sap, and the chlorophyll is confined to the spongy parenchyma in the lower three-fifths of the leaf. The fruit contains only faint traces of starch during early growth and none when it reaches maturity. During the growth of the fruit relatively small amounts of sugars are stored in it, but there is a rapid accumulation of sugars within the short period of normal ripening. The sugars of the fruit are derived from the starch previously stored in the stalk, hence pineapples gathered green do not develop a normal sugar content in subsequent ripening.

The authors found that the pineapple is exceedingly sensitive to adverse physical and chemical conditions in the soil. They suggest that other crops less sensitive to manganese than pineapples be grown on highly manganiferous soils. Thus far the best method of handling pineapples on manganiferous soils consists in applying soluble phosphates and planting old stumps instead of suckers.

The thirty years' record of a grass orchard, C. H. Hooper (*Jour. Bd. Agr. [London], 19 (1912), No. 7, pp. 541–545*).—A summarized account extending over 30 years is given of a small orchard, chiefly of cherries, showing actual returns and the method of cultivation adopted during that period.

An experiment in breeding apples, U. P. Hedrick and R. Wellington (*New York State Sta. Bul. 350, pp. 141–186, pls. 18*).—An experiment in breeding apples along Mendelian lines is here reported. The material for this work was derived from 148 crosses made in 1898 and 1899. The crosses were studied from both grafts and seedlings. Various numbers of the following crosses fruited: Ben Davis×Esopus, Green Newtown, Jonathan, McIntosh, and Mother; Esopus×Ben Davis and Jonathan; McIntosh×Lawyer; and Ralls, Rome, and Sutton×Northern Spy. A tabulated description of the crosses shows the size and shape of tree, yield in 1911, and the size, shape, color, flavor, and season of fruit, together with comparative notes. The transmission of characters among the different crosses is discussed and descriptions are given of a number of promising varieties secured from the crosses and named after counties in the State.

The authors find that these crosses strikingly contradict the idea that seedling apples revert to the wild prototype. The stimulus of hybridity was very marked in the vigor of the crosses under consideration, and the behavior of some of the crosses strongly suggests that apples may be prepotent in one or more of their characters. It is concluded that although the inheritance of skin color, flesh color, size, and shape is more or less hypothetical, acidity is undoubtedly inherited as a Mendelian character.

In regard to color of skin the fruits in which yellow predominates over red seem to be in a heterozygous condition for yellow and red. Fruits in which red predominates are either homozygous or heterozygous, and the pure yellows are homozygous. No conclusive data were secured as to color of flesh, although crosses of Ben Davis and of McIntosh appear to carry yellow and white, the white being recessive.

Establishing laws of inheritance of size and shape in apples promises to be a difficult task, since these characters are subject to so many external conditions. The data at hand, however, indicate that size and shape are inherited

practically as intermediates. The study of the inheritance of sweetness and sourness was based wholly on crosses of subacid varieties. The total progeny indicates strongly that crosses of these subacid varieties break up in the proportion of 3 sour apples to 1 sweet one.

The authors call attention to the following difficulties likely to arise in the application of Mendelian principles in the breeding of apples: The determination of the factors by which the various characters are transmitted; complications arising when a character skips a generation—does not appear in the F_1 generation; it is possible that some characters may be linked together in transmission and that others will repel each other; the bringing together of complementary characters may result in reversions and thus produce unexpected characters; the breeder will not be able to obtain new characters by working with Mendelian characters nor augment those that exist with the possible exception of size and vigor; it will be necessary to work with large numbers of plants—which is difficult with apples; disappointments will often come from the attempt to work with fluctuating variations; and there is likely to be much confusion between "simple Mendelian characters" and "blending characters."

Some new apples from known parents, F. H. Hall (*New York State Sta. Bul. 350, popular ed., pp. 12*).—A popular summary of the above bulletin.

Apples of Missouri, W. W. Chenoweth (*Ann. Rpt. Missouri Bd. Hort., 5 (1911), pp. 271–336, figs. 40*).—This comprises descriptions of Missouri's most important varieties of apples. The material is compiled principally from The Apples of New York (E. S. R., 17, p. 1157), only such changes having been made as were deemed necessary to adapt the subject matter to Missouri conditions.

Artificial cross-fertilization of the mango, A. J. Brooks (*West Indian Bul., 12 (1912), No. 4, pp. 567–569*).—A preliminary experiment in the development of improved varieties of mangoes by cross-fertilization is briefly described.

Report of the assistant horticulturist, T. B. McClelland (*Porto Rico Sta. Rpt. 1911, pp. 28–31*).—A brief statement of the station's work with coffee (E. S. R., 25, p. 746), vanilla, rubber (E. S. R., 25, p. 749), and cacao.

In addition to the old plantings of Porto Rican coffee a number of introduced coffees have now come into bearing. The coffee trees in the transplanting experiment begun in August, 1909, show a tendency toward earlier production where the trees were planted when less than a year old, and also where older trees were transplanted with a ball of earth. Storage and germination tests were conducted in 1909 and 1910 to determine whether the viability of coffee seed might be prolonged by excluding the moist air of the Tropics. In all these tests, the seeds which were very severely dried for any considerable length of time had their viability destroyed. A certain amount of moisture, as yet undetermined, appears to be necessary for its prolongation.

Experimental tapping of 8 to 9-year-old Castilla rubber trees gave only a slightly greater yield than that of the year preceding.

Fertilizers for carnations, D. Lumsden (*New Hampshire Sta. Bul. 159, pp. 3–14, figs. 4*).—This comprises a study of the relative value of nitrate of soda, muriate of potash, ground bone, a commercial fertilizer, and hen manure as top-dressings for carnation plants grown on raised benches in the greenhouse. Observations are also made relative to the difference in the keeping qualities of flowers raised under the various treatments given. Ground bone was found to give the best all around results, the vigor of the plants and the keeping qualities of the flowers being markedly superior to the plats treated with other manures.

Spraying calendar for 1912, R. K. BEATTIE and A. L. MELANDER (*Washington Sta. Popular Bul. 43, folio*).—Concise directions are given for the control of the more important insect pests and diseases of fruits and vegetables, together with instructions for making spray mixtures.

Rules and regulations for carrying out the Plant Quarantine Act (*U. S. Dept. Agr., Office Sec. Circ. 41, pp. 12*).—This circular contains the rules and regulations for carrying out the act of August 20, 1912, a summary of which has been previously noted (E. S. R., 27, p. 494).

FORESTRY.

The profession of forestry, H. S. GRAVES (*U. S. Dept. Agr., Forest Serv. Circ. 207, pp. 17*).—In this circular the author briefly reviews the rapid development of forestry in the United States and discusses forestry as a life vocation. Consideration is given to the character of the work involved, the elements necessary for success, the requirements for an adequate training, the present and probable future of recruits for government, state, and private work, teaching and research work, and its possibilities as a means of livelihood.

Annual report on the progress, literature, and important happenings in the realms of forestry, hunting, and fishing for the year 1911, H. WEBER (*Allg. Forst u. Jagd. Ztg., 1912, Sup., pp. VIII+186*).—As in previous years (E. S. R., 26, p. 338), this supplement contains abstracts of the more important literature of the various phases of forestry, together with notes on the principal occurrences relating to forestry, hunting, and fishing during 1911. As in the last supplement, the international scope of the literature reviewed has been strengthened.

Forestry and forest resources in New York, F. A. GAYLORD (*N. Y. Conserv. Com., Div. Lands and Forests Bul. 1, 1912, pp. 58, pls. 28*).—This is a conservation bulletin, part 1 of which describes actual forest conditions in this country and especially in New York State, and points out the harmful results which have obtained through waste in exploitation and lack of protection. Part 2 discusses the future possibilities of the forests, outlines the principles of practical forestry, shows what forestry has accomplished in many other countries, and what can be accomplished in this country under proper management.

Communication on the results of the Saxony state forest administration in 1911 (*Tharand. Forstl. Jahrb., 62 (1912), No. 4, pp. 373–377*).—A statistical and financial statement of the work and results of the forest administration in 1911 with comparative data for 1910.

On the influence of removing forest litter, SCHWAPPACH (*Ztschr. Forst u. Jagdw., 44 (1912), No. 9, pp. 538–558*).—The author has conducted observations for a great many years relative to the effect of removing forest litter on the growth of trees, as well as on the character of the undergrowth and the surface of the soil. The observations made in stands of pine, spruce, and beach, largely during the past 12 years, are here tabulated and discussed.

Generally speaking, removing the litter and raking the soil every year has been detrimental to wood accretion even on the better classes of soil. The decrease in wood accretion was also noticeable in stands where the litter was removed every 2 and 4 years. When the litter was removed only every 6 years, the loss in wood accretion was not great. Although removing the forest litter every year tends to stimulate natural regeneration, it also favors the growth of moss and other forest weeds. The injury to beech stands by a too frequent removal of litter was quite evident in the smaller growth of the leaves.

The woodsman's handbook, H. S. GRAVES and E. A. ZIEGLER (*U. S. Dept. Agr., Forest Serv. Bul. 36, rev., pp. 208, figs. 16*).—The present edition of this bulletin (E. S. R., 14, p. 576) has been revised and enlarged, taking the place of the proposed second part of the former bulletin and including both parts in one publication. The work as a whole comprises a collection of tables and rules of practical use to lumbermen, foresters, and others interested in the measurement of wood and timber. A summary of growth investigations is also included.

The Bradley bibliography, II.—Dendrology, Part II, A. REHDER (*Cambridge, Mass., 1912, vol. 2, pp. VIII+926*).—The present volume of the Bradley Bibliography (E. S. R., 26, p. 240) aims to contain the titles of all publications relating to families, genera, and species, together with references to descriptions, notes, and illustrations of woody plants contained in articles published in periodicals and serials and in smaller publications or in books dealing with subjects foreign to taxonomy where they are often apt to be overlooked.

Silvical leaflets (*U. S. Dept. Agr., Forest Serv. Silv. Leaflets 45, pp. 6; 51–53, pp. 4 each.*)—Four numbers of series of leaflets, each dealing with the range and occurrence, climate, associated species, habit, soil and moisture, tolerance, growth and longevity, susceptibility to injury, reproduction, utilization, and management of one of the following species of trees in the order corresponding to the leaflet numbers above: Western hemlock (*Tsuga heterophylla*), broadleaf maple (*Acer macrophyllum*), Oregon oak (*Quercus garryana*), and red alder (*Alnus oregona*).

Mechanical properties of redwood, A. L. HEIM (*U. S. Dept. Agr., Forest Serv. Circ. 193, pp. 32, figs. 8*).—This circular presents the results of one of the series of tests which the Forest Service has been making to determine the mechanical properties of the commercial woods of the United States (E. S. R., 25, p. 342; 26, p. 443). The tests here reported were conducted in cooperation with the universities of California and Washington.

The test material was divided into 2 classes, the first of which included stringers and joists containing defects similar to those present in timber purchased on the market. This material was tested to secure strength values for use in design, to find out whether there were differences in strength values of timber from different localities, and to determine the influence of seasoning and defects on the strength of commercial-sized timbers. The second class, made up of small, clear, straight-grained specimens cut from the uninjured portions of the tested stringers and joists, was tested to study the effects on their strength of the rate of growth, of the proportion of summerwood, and of the weight. Four kinds of tests were made to show strength in bending, in compression parallel to grain, in compression perpendicular to grain, and in resistance to shearing. The data secured in each of these tests are tabulated and discussed.

In conclusion the redwood lumber manufacturers' rules for grading are compared with a set of tentative grading rules for structural timbers prepared by the Forest Service.

The absorption of creosote by the cell walls of wood, C. H. TEESDALE (*U. S. Dept. Agr., Forest Serv. Circ. 200, pp. 7, fig. 1*).—Tests recently conducted by the Forest Products Laboratory and here tabulated and discussed show that a decided swelling takes place in wood impregnated with creosote. This swelling is caused by the absorption of the creosote by the cell walls. The average increases in volume resulting from the treatments of yew heartwood, yew sapwood, hemlock heartwood, and hard maple heartwood in percentage of the volumes before treatment were 6.81, 10.7, 7.3, and 8.14, respectively.

Condition of experimental chestnut poles in the Warren-Buffalo and Poughkeepsie-Newton Square lines after five and eight years' service, C. P.

WINSLOW (*U. S. Dept. Agr., Forest Serv. Circ. 198, pp. 13, figs. 2*).—This circular, which supplements a previous bulletin dealing with the preservative treatment of poles (E. S. R., 25, p. 344), gives the results of inspections of 2 experimental lines, 5 and 8 years, respectively, after their establishment.

The poles for the Warren-Buffalo line were cut and peeled during 1902 and 1903 and seasoned in single tiers about 2 ft. above the ground in June and July, 1905. Some were butt-treated with various preservatives by the brush method and others with coal-tar creosote by the open tank method (E. S. R., 19, p. 243). Six hundred and thirteen treated poles, together with 551 untreated seasoned and green poles were placed in a line extending through a variety of soil conditions.

At the end of 5 years both the green and seasoned poles butt-treated with coal-tar creosote by the open tank process showed practically no decay at or near the ground line. Poles brush-treated with 2 coats of coal-tar creosote, Avenarius carbolineum, S. P. F. carbolineum, and wood creosote showed but little difference in the extent of decay and ranked next best to the poles treated with coal-tar creosote in the open tank. Poles brush-treated with only 1 coat of preservative showed a much higher percentage of decay than those given 2 coats. With poles brush-treated with only 1 coat of creolin and of coal tar, the loss was nearly as great as with the untreated. The untreated poles were practically all more or less affected with decay at the ground line, the average loss of circumference for those seasoned prior to placement being 1.01 in. and for those placed green 1.15 in. An inspection relative to insect damage to poles in this line was made by the Bureau of Entomology and is discussed in a previous bulletin (E. S. R., 25, p. 51).

Only 72 poles were placed in the Poughkeepsie–Newton Square line and records showing the details of their preparation and treatment are not available. As inspected after a lapse of 8 years, however, the untreated poles set in crushed stone showed less decay at the ground line than similar poles set in sand, the average loss of circumference at that point being 1.77 in. and 2.27 in., respectively. The poles with charred butts showed less decay at the ground line than similar uncharred and untreated poles set in either crushed stone or sand, their average loss in circumference at the ground being only 0.71 in.

DISEASES OF PLANTS.

Report of the pathologist, G. L. FAWCETT (*Porto Rico Sta. Rpt. 1911, pp. 37–39*).—Spraying experiments with Bordeaux mixture on coffee trees were carried on with particular reference to its adhesiveness when used as a spray. Bordeaux mixture made up with but half the usual amount of water without the addition of any adhesives was found to adhere to the foliage better than Bordeaux mixture made by the usual formula to which adhesives were added.

A bud rot of the coconut has been found sporadically in a number of places but does not appear to be seriously affecting the groves. Bacteria have been isolated from the diseased tissue in every case studied, but no uniformity in the results of the studies has been obtained.

Work in soil biology has consisted largely in an examination of soils for protozoa, and in some of the so-called "sick" soils, where the conditions were the worst, the complete absence of protozoa was noted. Samples of these soils were disinfected with heavy applications of carbon bisulphid, but from the results of the study it appears that any benefit that is derived from the disinfection of the soils can not be attributed to the destruction of protozoa.

Root nodules were found to occur abundantly in the royal palm, and these have been studied with reference to their possible relation to nitrogen assimilation.

Where plants were grown in sterilized soil no fungus was found in conjunction with the nodules, but it was present in most of the other cultures, and except in the youngest nodules there was a rich development of proteids. Notes are also given on the occurrence of "air roots" on the royal and some other palms.

New diseases of cultivated plants, A. PUTTEMANS (*Bul. Soc. Roy. Bot. Belg., 48 (1911), No. 4, pp. 235–247, figs. 3*).—Three diseases are reported from Brazil as found there, usually on introduced plants, rarely on native species. A spot disease of begonia is claimed to be due to a new fungus here described as *Oïdium begoniæ*. A cauliflower disease is ascribed to *Alternaria brassicæ*. A parasite, found to cause a leaf spot of *Chrysanthemum indicum*, is described as a new species under the name *Cercospora chrysanthemi*.

Plant diseases, 1909–10, A. OSTERWALDER and O. SCHNEIDER-ORELLI (*Landw. Jahrb. Schweiz, 26 (1912), No. 6, pp. 275–279*).—A report is made concerning a large number of diseases due mostly to fungi noted in various localities as affecting fruit trees and fruits, grapes, vegetables, berry crops, and forest trees.

The influence of nutrition and weather upon plant diseases, L. HILTNER (*Jahrb. Deut. Landw. Gesell., 27 (1912), No. 1, pp. 156–169, pl. 1*).—Details are given of studies on several crops, leading to the conclusion that the known relation between weather and certain plant diseases consists not alone in the influence of weather upon disease-producing agencies directly, but also in its influence upon the plant itself and especially upon its nutrition.

The action of some acid salts upon the development of Aspergillus niger, A. KIESEL (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 2, pp. 193–196*).—A study was made by the author on the effects of 27 acids and acid salts on *A. niger* ascertaining in case of each the concentrations necessary to arrest, respectively, germination of conidia, development of mycelium, and fructification. The details are given in tabular form.

Contribution to the study of the sooty molds, G. ARNAUD (*Ann. École Nat. Agr. Montpellier, n. ser., 12 (1912), No. 1, pp. 23–54, figs. 13*).—In extension of previous work (E. S. R., 25, p. 452), the author gives detailed results of his studies, both morphological and physiological, on a number of species of the sooty mold, including the relations of certain of these molds to honeydew.

Studies in Chinese fungi, I. MIYAKE (*Bot. Mag. [Tokyo], 26 (1912), No. 303, pp. 51–66, pl. 1; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 7, p. 1675*).—Among the species of fungi discussed are many parasites of economic plants. Of these nine, claimed to be new, are described under the following names and in connection with the following hosts: *Cercospora alcuritidis*, on leaves of *Alcurites cordata; Helminthosporium sapii*, on leaves and leafstalks of *Sapium sebiferum; H. sesami*, on leaves of *Sesamum indicum; Brachysporium phragmitis*, on leaf nervures of *Phragmitis communis; Septoria amphigena*, on leaves of *Bupleurum falcatum; S. piri*, on leaves of *Pyrus sinensis; Nothopatella chinensis*, on branches of *Broussonetia papyrifera, Prunus persica*, and *Morus alba; Coniothyrium kraunhiæ*, on leaves of *Kraunhia floribunda; Macrophoma sophoræ*, on leaves of *Sophora japonica; Ustilaginoidea penniseti*, on glumes of *Pennisetum compressum*. Some of these are thought to be very destructive.

A review of grain diseases, 1911, E. RIEHM (*Centbl. Bakt. [etc.], 2. Abt., 34 (1912), No. 14–17, pp. 434–472*).—This is a comprehensive review of the literature of grain diseases and pests during 1911, with an extensive bibliography covering the year.

Control of loose smut of barley and wheat, R. SCHANDER (*Kaiser Wilhelms Inst. Landw. Bromberg, Abt. Pflanzenkrank. Flugbl. 16, 1912, pp. 4, fig. 1*).—This is a brief discussion of apparatus and methods for application of the hot-water

treatment to seed wheat and barley for protection against loose smut. See also a previous note (E. S. R., 24, p. 346).

A rust-resistant hybrid wheat, SCHRIBAUX (*Bul. Soc. Nat. Agr. France, 72 (1912), No. 7, pp. 636–640*).—The author gives an account of his attempts to secure by crossing a wheat resistant to the rust which annually attacks the grain in southeast France. He reports that a hybrid of Riéte with Japhet responded best to these efforts, producing a wheat having comparatively few beards, exhibiting in fair degree the desirable features of earliness, quality, yield, and resistance to rust, and giving promise of future improvement in these respects.

Dry spot of oats, H. ZIMMERMANN (*Mitt. Deut. Landw. Gesell., 26 (1911), No. 20, pp. 245, 246; abs. in Ztschr. Pflanzenkrank., 22 (1912), No. 4, p. 225*).—The author sums up the results of observations made on dry spot of oats in the region of Mecklenburg, describing the appearance and progress of plants showing the disease. This is said to be of very variable severity, and to be probably due to excessive or improper liming in case of certain sandy or light soils of that region.

Studies on canker in clover, L. HILTNER and G. GENTNER (*Prakt. Bl. Pflanzenbau u. Schutz, n. scr., 10 (1912), No. 8, pp. 90–95*).—This author claims that the appearance of clover canker, in most of the cases observed, was due to the use of imported seed and that different varieties of clover were affected in markedly different degrees. A brief discussion of the modifying effect on crop returns of climate and manures is also given.

The prevalence of disease among varieties of sugar cane, J. B. HARRISON and F. A. STOCKDALE (*Jour. Bd. Agr. Brit. Guiana, 5 (1912), No. 4, p. 226*).—The susceptibility of several varieties of Bourbon cane in regard to resistance to attacks of rind fungus is discussed.

Canker or rot of Solanaceæ: Eggplant, peppers, and tomato, P. VOGLINO (*Italia Agr., 49 (1912), No. 3, pp. 56–58, fig. 1; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 4, pp. 1065, 1066*).—*Ascochyta hortorum*, found in 1908 to cause a drying up of the leaves and fruits of eggplant, was in 1910 observed in France on stems of that plant. In the same year it was noted on tomato plants in Turin, the cankerous brown spots spreading from stalks and leaves to green or maturing fruits and darkening and rotting the pulp. Spraying with Bordeaux mixture proved an efficient remedy. The author offers the hypothesis that to this fungus also may be attributed the withering of peppers, producing much damage during recent years in Piedmont.

Celery blights and how to control them, E. M. STREIGHT (*Veg. Grower, 2 (1912), No. 3, pp. 4, 16, figs. 7*).—An account is given of the appearance, mode of attack, and progress of *Cercospora apii* and *Septoria petroselini*, said to cause, respectively, early and late blight of celery. Spraying with the usual Bordeaux mixture is claimed to prevent both spread and infection, if used in time.

Some apple diseases and their treatment, C. BROOKS (*New Hampshire Sta. Bul. 157, pp. 32, figs. 30*).—This is a revised edition of Bulletin 144 of the station (E. S. R., 22, p. 747), with some additional information relating to the fruit spot of the apple due to *Phoma pomi*, a preliminary account of which has been noted (E. S. R., 27, p. 652).

[Diseases of peaches in the Caucasus and resistant varieties], A. S. BONDARTSEV (*Zhur. Boliezni Rast., 5 (1911), No. 5–6, pp. 134, 135; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 4, p. 1061*).—Among the causes of diseases attacking peaches in the Caucasus region in 1911 are mentioned *Exoascus deformans*, *Cercospora cerasella*, *Puc-*

cinia pruni-spinosæ, *C. persicæ*, *Sphærotheca pannosa*, and *Monilia fructigena*. Varieties of peaches found resistant are named in connection with each of the first three fungi above listed.

A contribution to the study of olive rot, G. DE MICHELE (*Bol. Arbor. Ital.*, *7 (1911)*, *No. 3-4*, *pp. 179–192*, *figs. 7*).—This disease is said to affect old olive trees of diminished vitality, or young trees in consequence of injuries of improper culture. These conditions favor the activity of bacteria which produce changes in the living tissue followed by gradual death of the tree, the details of the process not yet being beyond dispute.

Incipient appearances are said to be subdued by cutting out cleanly the affected parts and thoroughly disinfecting the wounds. For more advanced stages a similar but more radical treatment is prescribed. Remedial measures looking to the preservation of vigor in the trees are also recommended.

Eruptive disease, or "exanthema," of orange trees in Australia, C. C. BRITTLEBANK (*Jour. Dept. Agr. Victoria*, *10 (1912)*, *No. 7*, *pp. 401–404*, *figs. 2*).—The author briefly describes this disease, which is claimed to be physiological and to be due primarily to weakened vitality. This weakening is attributed generally to porous, deep, coarse, sandy soil, lacking in organic matter, drying out quickly after rain; to continued drought followed by heavy rain; and to the presence of large amounts of nitrogenous manures.

Remedial measures suggested include the plowing in of green crops previously manured with superphosphates, and avoidance of nitrogenous manures.

Permanganate of potash in viticulture, C. TRUCHOT (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, *33 (1912)*, *No. 34*, *pp. 229–231*).—The author recommends as a remedy for a gray rot of grapes, ascribed to *Botrytis cinerea*, a mixture of 15 parts of permanganate of potash with 85 parts of sifted lime, applied in powdered form, preferably after rain or a heavy dew. In a second formula, 5 per cent of alum replaces an equal proportion of the permanganate. The action is claimed to be certain.

Grape chlorosis and its treatment with sodium nitrate and iron sulphate, E. CHANCRIN (*Jour. Agr. Prat., n. ser., 23 (1912)*, *Nos. 22*, *pp. 683–686; 23*, *pp. 715, 716*).—Chlorosis of grape leaves is here held to be due in general to poor nutrition, most commonly with lime as a primary injurious factor assisted by various secondary conditions.

Experiments were conducted under direction of the author in treating seriously affected vines with solutions of sulphate of iron and nitrate of soda. The iron salt did not give very good results. The treatment with nitrate of soda in most instances showed considerable improvement, and in many cases complete recovery, where the dose amounted to 25 or 30 gm. per stock.

The subsequent influence of fungicides on the vigor and production of grapevines, and their resistance to chlorosis, J. L. VIDAL (*Rev. Vit.*, *37 (1912)*, *No. 965*, *pp. 813–818*, *figs. 2; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases*, *3 (1912)*, *No. 8*, *pp. 1887, 1888*).—The experiments reported are said to indicate that mildew exercises a more or less remote influence on grapevines, as shown by the reduction of resistance to chlorosis, weakening of vegetation, and lowering of productivity, these influences being somewhat proportional to the damage inflicted at any given time by the fungus, early invasions usually resulting in greater subsequent damage to the vines.

The author concludes that protection by spraying should extend not only to present crops but to vines with a view to future returns, even light attacks of mildew being carefully guarded against for the sake of greater vigor in the vines.

The conditions for development of grape mildew, L. RAVAZ and G. VERGE (*Les Conditions de Développement du Mildiou de la Vigne. Montpellier, 1912, pp. 61, figs. 9*).—The authors here present in connected form the results of their studies on the conditions controlling the development of grape mildew, most of which have already been previously noted (E. S. R., 27, p. 449).

Third year's experiments in the treatment of grapevine mildew in the Bombay Presidency, W. BURNS and G. B. PATWARDHAN (*Dept. Agr. Bombay Bul. 51, 1912, pp. 6*).—In the third year of experimenting for the control of grape mildew (E. S. R., 27, p. 49) sprayings from 3 to 5 in number were given in 3 districts. The resulting percentages of mildewed grapes ranged from 1.7 to 21, averaging 9.7 per cent, for sprayed vines; and from 42 to 100 per cent, averaging 68.8 per cent, for unsprayed vines. The sprayings recommended employ Bordeaux mixture of full strength about the middle of May, August, and October, and of half strength again about the first of December and January with plenty of soap to make the fungicide stick to the bunches.

The amount of copper left on the grapes was not considered deleterious to users and the stains were found to be easily removable by simply dipping in weak vinegar or soaking in clean water over night.

A new plan of attack on grape mildew, H. FAES (*Bul. Soc. Agr. France, 1912, May 15, pp. 513–523*).—The substance of this article has already been noted (E. S. R., 26, p. 550).

The spread of American gooseberry mildew, S. CASTLE (*Gard. Chron., 3. ser., 52 (1912). No. 1338, p. 138*).—The author reports that in the neighborhood of Wisbech the American gooseberry mildew is making rapid headway in spite of all efforts looking toward its control.

Two fungus diseases of tulip bulbs, A. A. ELENKIN (*Zhur. Boliezni Rast., 5 (1911), No. 5–6, pp. 105–124; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 4, pp. 1066, 1067*).—Tulip bulbs were attacked by two different fungi, the first being recognized as *Botrytis cinerea*, the second in form and habits somewhat resembling *Sclerotium tuliparum*, and possibly being identical therewith. The two are usually found on the same bulb, rarely attacking separate plants. Methods of control recommended are uprooting and burning of affected bulbs, and disinfection of the soil with carbolineum.

A new bacterium causing a disease of Matthiola annua, G. BRIOSI and L. PAVARINO (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 21 (1912), II, No. 3, pp. 216–220*).—A disease of *M. annua* is described which, it is said, may extend to any part of the plant. A bacterium was isolated and cultivated to which the disease is ascribed. The organism is claimed to be new and has received the name *Bacterium matthiolæ*.

Observations on Asarum europæum and its mycorrhiza, E. J. SCHWARTZ (*Ann. Bot. [London], 26 (1912), No. 103, pp. 769–776, pls. 2*).—As a result of the author's investigations, it is stated that *A. europæum* harbors in its roots a fungus very similar to those of *Thismia aseroë* and *Neottia nidus-avis*, and limited to the cortical region abutting on the steles of the young roots. Thick-walled swellings found on some hyphæ are said to represent a resting stage of the fungus. A bibliography is appended.

Knobs and exostoses on trees, E. LEMÉE (*Rev. Hort. [Paris], 84 (1912), No. 14, pp. 336–338, figs. 16*).—Attention is called to various kinds of swellings and excrescenses on roots, trunks, limbs, and twigs of certain trees, known or suspected to be due to the activity of fungi or other parasites.

Studies on gum flow and frost injuries of various trees, II, P. SORAUER (*Landw. Jahrb., 41 (1911), No. 1, pp. 131–162, pls. 2; abs. in Bot. Gaz., 54 (1912), No. 2, pp. 173, 174*).—In continuation of previous work on the factors

operative in gummosis (E. S. R., 23, p. 353; 24, p. 554), the author holds that stimuli, such as frosts and wounds, only accentuate a natural tendency latent in cherry and other trees to gummy degeneration and related phenomena due to variations in growth and nutrition which may be regarded as not abnormal. These may result in cell immaturity, unbalanced tensions, excess of enzyms, and degeneration processes extending from cell to cell. Such groups of degenerated cells are usually more abundant in the late fall growth. Looseness of structure appeared to be closely related with susceptibility to frost influence and formation of gum.

Detailed studies were made of numerous widely separated genera of trees.

The Pennsylvania Chestnut Blight Conference (*Harrisburg: State, 1912, pp. 253, pls. 43*).—This is a report of the proceedings of a conference, called by the Governor of Pennsylvania to meet at Harrisburg, Pa., February 20 to 21, 1912, to consider ways and means of preventing the spread of the chestnut tree bark disase. An address by the governor, and numerous papers, reports and discussions by scientists, foresters, manufacturers, and others, bring out what was known at that date and what it was considered should be known concerning this disease.

Notes on the chestnut bark disease, H. R. Fulton (In *Pennsylvania Chestnut Blight Conference. Harrisburg: State, 1912, pp. 48–56*).—The author reports on a study of the means, methods, and conditions of transmission of this disease, in substance briefly as follows:

The infective material in case of *Diaporthe parasitica* consists in its conidia and its ascospores. Tests made with air currents as carriers of conidia, dry, damp, and under strong spraying to simulate storm conditions, showed that conidia can be detached by strong air blasts and carried short distances. Conidia in a dry room at ordinary temperature, retained their germinability for four months, but not for five, while material exposed out of doors and that kept moist at about 75° F. in a greenhouse did not germinate after four months. Both kinds of spores germinated in a decoction of chestnut bark, in rice broth, etc. Ascospores germinated in spring water, while conidia did not. Germinability of conidia is most favored at 60°, decreasing considerably at 10° above or below that point. Ascospores germinated best at 70°, but also fairly well at 45° or 85°, and they still germinated readily after at least moderate freezing. The effect of extreme temperatures was not investigated. In general, the most rapid early growth is at the optimum temperature for germination.

In the laboratory the fungus grows well on a variety of artificial media, particularly on a slightly acid potato agar. Some evidence seems to point to the possibility of its living on at least dead parts of trees other than chestnut, as oaks, etc., though such have not been shown to be diseased by the fungus. Infections were found where injuries to chestnuts had been inflicted by lightning, etc., both sapwood and heartwood becoming infected by spreading of the fungus if the cut surface was kept moist. Insect injuries also appeared to be favorable points for development of infection from spores. Field studies at Orbisonia, Pa., seem to indicate that there had been a very rapid spread of the disease recently; that insects may carry infection up the branches and into the cracks and holes; that moisture favored infection in certain cases; that younger trees were more susceptible than older ones; and that birds were not notably, if at all, connected with the carrying of spores.

[Longevity of mycelium and spores of Diaporthe parasitica]. Caroline Rumbold (In *Pennsylvania Chestnut Blight Conference. Harrisburg: State, 1912, pp. 241, 242*).—An attempt was made to germinate spores from an infected piece of chestnut collected in July, 1908, and kept continuously in a moist cell until April, 1912. The fungus made a small growth, but after start-

ing to produce a small number of pycnidia it ceased to grow. Spores also germinated, but these too made only a small growth, producing no pycnidia. The apparent loss of vitality, it is suggested, might have been due to Penicillium, a growth of which covered the surface of the specimen.

The possibility of a medicinal remedy for chestnut blight, CAROLINE RUMBOLD (In *Pennsylvania Chestnut Blight Conference. Harrisburg: State, 1912, pp. 57, 58*).—The author reports in regard to medicinal treatment of chestnut blight that experiments are under way, but are as yet incomplete, considering the influences of soil and atmospheric moisture, of fertilizers, of healthful or unhealthful surroundings and conditions of the tree, of wounds, etc., on the susceptibility of the tree to disease, and on its reaction to treatment. She states also that experiments to test the relative vitality of the mycelium and of the two kinds of spores and others with chemicals toxic to the fungus are in progress, as well as studies on the question of immunity of different kinds of trees.

The biological relations of Rhytisma acerinum to various maples, K. MÜLLER (*Ber. Deut. Bot. Gesell., 30 (1912), No. 7, pp. 385–391*).—The author investigated *R. acerinum* for the purpose of determining whether or not this fungus is to be classed as a single species. Inoculation experiments were carried on with several species of maple in the open air during 1908–1911 with the following results:

Spores from *Acer platanoides*, which is widely distributed, easily infected this maple and *A. campestre*, but, in general, only partially and weakly *A. pseudoplatanus* and *A. dasycarpum*.

Morphologically similar fungi from *A. pseudoplatanus* from several localities severely infected the same maple in the locality of the experiment, while the other species of maple were not attacked at all. This biologically distinct species of fungus was named *R. pseudoplatani*. *R. punctatum*, which is claimed to be limited to *A. pseudoplatanus*, is morphologically distinguished from *R. pseudoplatani* by its larger sclerotia and spores.

Spores from the fungus on *A. campestre* attacked this maple severely, less so *A. platanoides*, and not at all *A. pseudoplatanus*. The fungus is considered to be a specialized form of *R. acerinum*, less distinct than is *R. pseudoplatani*, and to it the name *R. acerinum campestris* is given. Further reports are promised on the morphological relations of *R. acerinum*.

Oak disease in 1909 and 1910, É. PAQUE (*Bul. Soc. Roy. Bot. Belg., 48 (1911), No. 1, pp. 22–26*).—A brief account is given of the oak disease due to Oïdium in France. During 1909 and 1910 its intensity is said to have diminished somewhat in that section. Lists are given of the species of trees attacked and those exempt. Attention is drawn to the fact that, while almost every native oak was attacked, nearly all foreign species in the same forests appeared resistant to this fungus.

The oak Oïdium in France, G. TRINCHIERI and L. MANGIN (*Jour. Agr. Prat., n. ser., 23 (1912), Nos. 16, pp. 496, 497; 23, pp. 719–721*).—This is a continuation of contributions made by these authors and by G. Arnaud and E. Foëx on oak Oïdium (E. S. R., 20, p. 757; 23, p. 354; 25, p. 248; 27, p. 753), the later discussions being somewhat controversial.

Oak Oïdium in Sologne, E. NOFFRAY (*Bul. Soc. Nat. Agr. France, 72 (1912), No. 7, pp. 575–584*).—An account is given of the appearance of oak Oïdium in Sologne in 1907 and of its progress, habits, and damage in that district.

It is stated that but slight infection by this fungus is noted in growths of 4 years and over, but that it severely attacks the younger trees and branches. From this fact it is concluded that this fungus may be checked, possibly exterminated, in a few years by sacrificing these younger growths for a while, if

necessary, and by early and free use of such fungicides as sulphur, polysulphids, and permanganate of potash with a view to prevention rather than cure.

A root disease of the Para rubber tree (Fomes semitostus). K. BANCROFT (*Dept. Agr. Fed. Malay States Bul. 13, 1912, pp. 30, pls. 79*).—This is a brief discussion of the history, distribution, spread, symptoms, and treatment of the root disease of *Hevea brasiliensis* and of its relation to other hosts and to attacks by insects.

The disease attacks the roots, cutting off the water supply, yellowing and wilting the leaves, and killing the trees in from 4 months to 2 years according to age. The fungus seems to propagate itself mainly by means of mycelium which spreads in the roots, living or dead, also to some extent in the soil, attacking live roots of young or old trees, but soon disappearing if left without its customary substratum.

Moisture, abundance of vegetable matter, acidity of soil, and darkness favor mycelial growth. Experiments with artificial infections by means of mycelium were successful in 10 out of 14 plants tried. Infection of living plants from dead roots is thought to be the usual mode of transmission. Spores arise from two forms of fructification, but are not known to carry the disease. Several other hosts are known, all being woody plants.

Methods of treatment include isolation by means of trenches; sanitation by removal or burning in place of all infected or suspected trees or parts; application of lime to neutralize acidity, and possibly as a fungicide; drainage; and utilization of the space with immune trees, while the infected roots of the removed trees are disappearing from the soil.

A brief bibliography is appended.

Two new diseases of Sophora japonica, M. TURCONI and L. MAFFEI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 21 (1912), II, No. 4, pp. 246–249*).—This is a preliminary note descriptive of two new fungi, which have received the names *Macrosporium sophoræ* and *Gibberella briosiana*, attacking, respectively, leaves and branches of the pagoda tree of China and Japan.

A case of gummosis in teak, J. A. HONING (*Meded. Deli-Proefstat. Medan, 7 (1912), No. 1, pp. 12–15, 59*).—An account is given of the evident infection of teak nursery stock with *Bacillus solanacearum*, causing gummosis, this being claimed to be the first instance in which this plant has been attacked by this disease.

Macrophoma excelsa infestans parasitic on Abies concolor in Russia, I. A. OHL (*Zhur. Bolieźni Rast., 5 (1911), No. 5–6, pp. 127–134, pl. 1, figs. 2; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 4, pp. 1067, 1068*).—In Poltava *A. concolor* showed disease due to a parasite identified as a Macrophoma, for which the author suggests the name *M. excelsa infestans*. The use of fungicides in spring, and burning and removal in autumn, are remedial measures recommended.

Lophodermium nervisequum parasitic on fir needles, E. MER (*Bul. Soc. Nat. Agr. France, 72 (1912), No. 7, pp. 615–625; Rev. Eaux et Fôrets, 51 (1912), No. 16, pp. 481–493, pl. 1*).—Pursuant to studies previously noted (E. S.-R., 25, p. 47; 26, p. 451) with *L. macrosporum* on spruce, the author reports his investigations with *L. nervisequum*, parasitic on fir, which it is said to attack when meeting it in a state of deficient nutrition, and causing, as does *L. macrosporum*, considerable loss in France. Experiments seem to show the protective value of keeping trees well nourished and vigorous.

Root disease of pine, M. MANGIN (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 23, pp. 1525–1528*).—The author made a study of this disease, of the fungus (*Rhizina inflata*) said to cause it, and of the effects of forest fires

which are claimed to favor its attacks. As a result of these investigations, the conclusions are reached that *R. inflata* is common even on sound trees throughout the pineries of Fontainebleau; that the development of the fruiting bodies is favored by the fertilizing constituents of ashes left by forest fires and woodmen's fires; and that it is at present doubtful whether the disease is caused by invasion of the pine roots by the mycelium of *R. inflata* which, according to the author, occurs rather after the weakening of the tree by the disease, the reason of which he claims to be at present unknown.

Experiments in spraying with polysulphids and other fungicides in 1911, E. PANTANELLI (*Staz. Sper. Agr. Ital., 45 (1912), No. 3, pp. 161–190*).—The author's experiments resulted in the following conclusions:

The polysulphids of calcium, barium, and zinc with sodium have shown an efficacy equal or superior to that of Bordeaux mixture in controlling *Exoascus deformans* and other fungus diseases of peach and apple. They have also been used with success against Oïdium of rose, oak, and euonymus, against *Exobasidium azaleæ*, etc. These polysulphids and combinations thereof with Bordeaux mixture, acetate of copper, and nitrate of silver are recommended as efficacious also against Peronospora and Oïdium of the grape. The polysulphids of barium and zinc with sodium are said to show a stimulating action on vegetation, especially that of peaches, and to be harmless to both leaves and flowers, whereas those of calcium are fatal to the foliage of the peach. The question of relative cost is also discussed.

[The mechanical reduction of spray particles], P. LARUE (*Rev. Vit., 37 (1912), No. 967, pp. 879–881, figs. 5*).—This is a report on experiments made with nozzles of various forms, but having orifices mainly cylindrical with a conical flare.

It is stated that no conclusions have been drawn as to the best form, but that a suitable smallness of droplets could not be attained at a shorter distance than 50 cm. from the nozzle. This fact is said to be an obstacle to the employment of devices for spraying stems, branches, and lower leaf surfaces with the maximum of economy as regards liquid and labor.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Distribution and origin of life in America, R. F. SCHARFF (*London, 1911, pp. XVI+497, pls. 21*).—The chapters of this work are devoted to the fauna of Greenland, the fauna of northeastern North America, the animals of the Canadian Northwest, the fauna of Alaska, the Rocky Mountains and their inhabitants, the animals of the Eastern States, the fauna of the Continental Basin, the Southeastern States and Bermuda, southwestern North America and its fauna, the fauna of Central America, the West Indian Islands and their inhabitants, the fauna and flora of the Galapagos Islands, the animals of the northwestern States of South America, the fauna of eastern South America, and Argentina and Chile.

A bibliography of the principal works consulted in its preparation, consisting of 32 pages, and a general index are included.

Food of some well-known birds of the forest, farm, and garden, F. E. L. BEAL and W. L. MCATEE (*U. S. Dept. Agr., Farmers' Bul. 506, pp. 35, figs. 16*).—This bulletin deals with 20 birds selected because of their economic importance to farmers and fruit growers of the respective regions they inhabit. With the exception of 3 species of sapsuckers, all the birds treated are beneficial and should be recognized and protected. The species considered are, the three-toed woodpeckers (*Picoides arcticus* and *P. americanus*); California woodpecker (*Melanerpes formicivorus bairdi*); Lewis woodpecker (*Asyndesmus*

lewisi); red-bellied woodpecker (*Centurus carolinus*); sapsuckers (*Sphyrapicus varius*, *S. ruber*, and *S. thyroideus*); hummingbirds (*Archilochus colubris* and *Calypte anna*); Arkansas kingbird (*Tyrannus verticalis*); ash-throated flycatcher (*Myiarchus cinerascens*); western yellow-bellied flycatcher (*Empidonax difficilis*); horned lark (*Otocoris alpestris*); chipping sparrow (*Spizella passerina*); junco or snowbird (*Junco hyemalis*); white-crowned sparrow (*Zonotrichia leucophrys*); southern butcher bird (*Lanius ludovicianus*); Audubon warbler (*Dendroica auduboni*); and ruby-crowned kinglet (*Regulus calendula*).

Fish and game laws of New Jersey (*Trenton, N. J., 1912, pp. 232, pl. 1*).—This is a compendium of the New Jersey laws.

Capture of Raleigh by the wharf rat, C. S. BRIMLEY (*Jour. Elisha Mitchell Sci. Soc., 28 (1912), No. 2, pp. 92–94*).—The author reports that while known to have been at Beaufort in 1870, the wharf rat was not observed in Raleigh until 1909. Two years later it appeared in great abundance and slaughtered large numbers of young chickens. The wharf rat is strongly inclined to burrow, while the black and brown rats are climbers.

Life histories of Indian insects, II, D. NOWROJEE (*Mem. Dept. Agr. India, Ent. Ser., 2 (1912), No. 9, pp. 165–191, pls. 7, figs. 2*).—A number of aquatic Hemiptera and Coleoptera are taken up in this second paper (E. S. R., 24, p. 758).

Recent investigations in insect parasitism, O. H. SWEZEY (*Hawaii. Forester and Agr., 9 (1912), Nos. 3, pp. 83–87; 4, pp. 130–135*).—A review of recent work.

The effect of heat on certain insect enemies of plants, J. CHAINE (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 26, pp. 1833–1836*).—High temperatures during the latter part of June and early July, 1911, when the thermometer reached 37° C. (98.6° F.) in the shade, together with a prolonged drought, resulted in the destruction of larvæ and chrysalids of the cochylis moth to such an extent that in certain regions the second generation was nearly completely annihilated. The cecidomyid *Nonarthropalpus buxi*, which develops in boxwood leaves, is said to have been similarly destroyed.

Report of the entomologist, W. V. TOWER (*Porto Rico Sta. Rpt. 1911, pp. 32–36*).—The work of the year consisted largely of the study of the white grub on cane and an ant which infests coffee and practically all its shade trees. A mosquito survey of San Juan was commenced.

In a study of the flora of practically all districts of the island, undertaken since the bee work previously noted (E. S. R., 26, p. 62), a great number of shade trees used in coffee plantations have been found to produce nectar. In the lowlands guamá (*Inga laurina*), which is by far the best honey plant on the island, is used almost entirely, while in the interior the guava is the principal shade tree in coffee plantations. It is said to be not uncommon for a good strong hive of bees to gather from 5 to 11 lbs. a day from the guamá, which blossoms from 2 to 5 times a year, the bloom lasting from 10 to 15 days. The honey produced is very light in color, resembling the clover honey of the North and running about 12 lbs. to the gallon.

In order to determine the annual production of honey by a good colony, 2 colonies were placed on a pair of scales and their weights taken morning and evening. "The readings showed at what seasons the bees were most active; also what flowers produced the greatest quantity of honey. During a period of 9 months from one of the colonies there were extracted 470 lbs. of honey, while the other produced 337 lbs. The only period when both colonies were not gathering was during September, and during this month the small colony gathered sufficient honey so that it did not have to use any of its surplus. Beginning the latter part of February and through March, April, and May, the bees worked on the general bloom, and it was not uncommon for them to gather

from 1 to 2 lbs. of honey per day." During July and August one of the hives gathered 203 lbs. of honey.

While the native mangoes, with one exception, are comparatively free from insect infestation some of the imported varieties appear to be seriously attacked by the fruit fly (*Anastrepha acidusa*). This fly is very partial to the Cambodiana, practically ruining this variety, it being almost impossible to find a ripe mango that does not contain from 2 to 5 maggots. Upon completing their development the maggots pass into the ground to a depth of 1 to 1½ in. where they pupate in about 24 hours, the pupal period lasting from 13 to 16 days.

A small white scale, which occurs in India; was found on the trunks and large branches of the mango but does not seem to spread rapidly in Porto Rico. At Mayaguez this scale has been found parasitized by the common black fungus, occurring on the white scale of the orange, and a brown fungus which is found on the purple scale in the mountains. Thrips are said to be plentiful on some varieties of mangoes, especially those infested by the fruit fly.

Reports of entomological department, A. E. Stene et al. (*Ann. Rpt. Bd. Agr. R. I., Ent. Dept., 26 (1910), pp. 40+11+39, pls. 7, figs. 21*).—The several parts of this report deal with nursery inspection, insect notes, report of apiary inspection, the gipsy and brown-tail moth situation, the elm-beetle and San José scale work, bee keeping in Rhode Island, and how to keep bees.

Combating scale and other insects, L. Trabut (*La Défense contre les Cochenilles et autres Insectes Fixés. Algiers: Gouvt. Gén. Algérie, 1910, pp. 151, pls. 4, figs. 127*).—Noted from another source (E. S. R., 27, p. 357).

Insect pests, J. H. Fabre (*Les Ravageurs; Récits sur les Insectes Nuisibles a l'Agriculture. Paris, [1912], pp. 282, pls. 16*).—This is a small popular work.

Sugar cane insects in Trinidad, F. W. Urich (*West Indian Bul., 12 (1912), No. 3, pp. 388–391*).—The principal cane pests and their status in Trinidad are briefly noted.

The enemies of the olive, P. Papageorgiou (*Ann. Gembloux, 22 (1912), No. 9, pp. 521–531*).—The author here gives a brief account of the olive scolytid (*Phlœotribus oleæ*), olive fly (*Dacus oleæ*), olive scale (*Lecanium oleæ*), and sooty mold (*Fumago oleæ*), and means of combating them.

Insects attacking the prune in the Pacific Northwest, A. B. Cordley (*Better Fruit, 7 (1912), No. 2, pp. 9–13, figs. 6*).—This is a brief popular account of the more important insect enemies of the prune, including the western peach and prune borer (*Sanninoidea opalescens*), San José scale, prune twig miner (*Anarsia lineatella*), bud-moth, shot-hole borer (*Xyleborus dispar*), cicadas, the branch and twig borer (*Polycaon confertus*), and tent caterpillars (*Malacosoma* spp.).

Natural enemies of the banana occurring in Queensland, H. Tryon *Queensland Agr. Jour., 28 (1912), No. 5, pp. 360–363*).—The insect pests here mentioned are the fruit fly *Dacus* (*Tephritis*) *tryoni* and a leaf-eating weevil (*Coptorhynchus* sp.).

Insect pests of cacao, P. L. Guppy (*West Indian Bul., 12 (1912), No. 3, pp. 310–320*).—In addition to a somewhat detailed account of the cacao beetle (*Steirastoma depressum*) and cacao thrips (*Heliothrips rubrocinctus*), the author presents a preliminary list of 30 insects affecting the cacao tree, arranged more or less in the order of their importance.

Coconut pests, O. W. Barrett and D. B. Mackie (*Philippine Agr. Rev. [English Ed.], 5 (1912), No. 5, pp. 254–261, pls. 5*).—This is a brief account of the enemies of the coconut, including insects, diseases, mammals, birds, and Crustacea.

It is said that of 75 or more recorded insect pests of coconut there are only 5 or 6 species that are actually injuring the crop to any great extent and of these

only 2 are of prime importance in the Philippines. "Throughout the Philippine Archipelago, and in fact in all southern Asia and the Malaysian regions, the uang, or rhinocerous beetle (*Oryctes rhinoceros*) causes a tremendous amount of damage. . . . The red weevil (*Rhynchophoras ferrugineus*) is the second most destructive insect attacking coconuts in the Philippines."

The enemies and diseases of the coffee tree in East Africa, H. MORSTATT (*Pflanzer, 8 (1912), Beiheft 2, pp. V+87, pls. 14*).—The first part of this paper (pp. 1–74) is devoted to a discussion of the various animal enemies of the coffee tree, of which the insects make up the greater part.

Forest entomology in the United States, K. ESCHERICH (*Naturw. Ztschr. Forst u. Landw., 10 (1912), No. 9, pp. 433–446, figs. 4*).—This is a review of the work carried on by the forest insect division of the Bureau of Entomology of this Department, and includes a list of the more important writings on the subject by A. D. Hopkins.

Tetriginæ (Acridiinæ) in the Agricultural Research Institute, Pusa, Bihar, with descriptions of new species, J. L. HANCOCK (*Mem. Dept. Agr. India, Ent. Ser., 4 (1912), No. 2, pp. 131–160*).—Some 24 species are described as new in this paper.

A new pest to maize, C. FRENCH, Jr. (*Jour. Dept. Agr. Victoria, 10 (1912), No. 7, pp. 450, 451, figs. 2*).—The harlequin fruit bug (*Dindymus versicolor*) is reported to have been the source of injury to corn at Omeo, Gippsland. The injury is caused by sucking the juice from the kernels at the end of the cob.

A note on acid-fast bacilli in head lice (Pediculus capitis), G. W. MCCOY and M. T. CLEGG (*Pub. Health and Mar. Hosp. Serv. U. S., Pub. Health Rpts., 27 (1912), No. 36, pp. 1464, 1465*).—In recent work in connection with the study of the possibility of the transmission of leprosy by animal parasites, the authors have found a large number of acid-fast bacilli in smears made from 2 lice (*P. capitis*) taken from an advanced case of nodular leprosy. In morphology, grouping, and tinctorial characteristics, the organisms found in these insects were indistinguishable from the leprosy bacillus.

Leafhoppers affecting cereals, grasses, and forage crops, H. OSBORN (*U. S. Dept. Agr., Bur. Ent. Bul. 108, pp. 123, pls. 4, figs. 29*).—This bulletin is based upon investigations made in the field, on farms and ranges, under natural conditions in various parts of the United States, and deals particularly with those species affecting the cultivated crops.

On grasses and grains the attack is more commonly noticed in the form of wilted or discolored blotches on the leaves or stems. The author believes that the condition known as "silver top," a whitening of the entire upper part of stem and head, is at times, in blue grass particularly, caused by leafhopper attack. The puncturing of the tissue and pumping of the plant juices result in more or less loss and drain on the plant, the importance of the attack depending upon the abundance of the insects. "All of the crops belonging to the grass family and most of those in general cultivation belonging to the legumes are infested by one or another, often by many, species of the leafhoppers. The abundance and corresponding injury vary greatly with these crops for different parts of the country and under different cultural conditions, as also with different seasons . . . For the wheat, oats, rye, and barley crops the most important species are, in the North and Northwest, *Cicadula 6-notata* and *Athysanus exitiosus*, and in the South *A. exitiosus* and *Dræculacephala reticulata*. For the grass crop, including timothy, brome grass, and blue grass, the most important species are *Deltocephalus inimicus, D. affinis, D. configuratus, Dræculacephala mollipes*, and *Phlepsius irroratus*. For clover, alsike, alfalfa, soy beans, and leguminous crops the most important are *Agallia sanguinolenta* and *Empoasca mali*. The

fact that in many parts of the country their injury is negligible for such crops as wheat, oats, rye, etc., is due to the rotation or alternation of crops in such manner as to make their rapid increase impossible."

Other species considered in addition to the above mentioned are *Draeculacephala novcboracensis*, *Diedrocephala coccinea*, bog leafhopper (*Helochara communis*), *Gypona octolineata*, *G. bimaculata*, *Tettigonia bifida*, *Hecalus lineatus*, shovel-nosed leafhopper (*Dorycephalus platyrhynchus*), *Paraboloeratus viridis*, sharp-nosed leafhopper (*Platymetopius acutus*), yellow-faced leafhopper (*Platymetopius frontalis*), *P. cinereus*, *Deltocephalus sonorus*, *D. fuscinervosus*, Say's leafhopper (*D. sayi*), *Athysanus curtisii*, *A. bicolor*, *A. obtutus*, and geminate leafhopper (*Thamnotettix geminatus*).

Remedial measures are discussed under the headings of cultural methods, mowing, burning, capturing in hopperdozers or tar pans, and spraying, all of which must be adapted for the seasons or conditions of the crop.

What are we going to do about the froghopper? J. J. A. CARLEE (*Proc. Agr. Soc. Trinidad and Tobago, 12 (1912), No. 8, pp. 265–272*).—A discussion of the present status of the froghopper situation in Trinidad.

The spring grain-aphis or "green bug," F. M. WEBSTER and W. J. PHILLIPS (*U. S. Dept. Agr., Bur. Ent. Bul. 110, pp. 153, pls. 9, figs. 53*).—This is a complete report of investigations commenced in the spring of 1907 and continued without interruption up to and including 1911. Preliminary reports upon the work have been previously noted (E. S. R., 19, pp. 53, 452).

The authors first consider the occurrence of the pest in the Old and New World. In the United States outbreaks occurred in 1890, 1901, 1903, and 1907. Then follow accounts of its food plants, character of attack, viviparous and oviparous development, influence of winds and of temperature on diffusion, its embryology, natural enemies, and remedial and preventive measures.

Field spraying experiments indicate spraying to be an impractical measure, even when small areas are involved. Burning or plowing are thought to be more effective. Lime and sulphur dusted on the plants in badly infested areas gave practically no benefits. It is recommended, especially for the South, that all volunteer growth of whatever nature be completely killed out in the fields before seeding the following crop, and it is thought that if this be done such ravages as have occurred in the past can not be repeated.

Investigations seem to indicate that no noticeable good resulted from the introduction of the parasite *Aphidius testaceipes*. "When one stops to consider the numerous and varied hosts of *A. testaceipes*, its manner of hibernation, its wide distribution, and the higher temperature required for its development over and above that needed by its host; also the fact that it may readily be transported along with its host as adults, or within the body of the latter, one can readily see the futility of attempting materially to increase its numbers or efficiency by artificial introduction into grain fields."

Aphididæ of southern California, VIII, E. O. ESSIG (*Pomona Col. Jour. Ent., 4 (1912), No. 2, pp. 698–745, figs. 17*).—This continuation of the author's studies (E. S. R., 26, p. 149) includes descriptions of several new genera and species.

Woolly aphis, or American blight (Schizoneura lanigera), W. W. FROGGATT (*Agr. Gaz. N. S. Wales, 23 (1912), No. 6, pp. 520–528*).—This is a summarized account.

A contribution to the knowledge of the Phylloxerinæ, B. GRASSI ET AL. (*Contributo alla Conoscenza delle Fillosserine ed in Particolare della Fillossera della Vite. Rome, 1912, pp. X+456+LXXV, pls. 20, figs. 31*).—The first part of this work (pp. 3–86) deals with studies of phylloxera other than that

of the vine; the second part (pp. 87–417) with studies of the grapevine phylloxera (*Phylloxera vastatrix*) with observations comparing it with other species. A bibliography of 13 pages follows.

A second paper, by Anna Foá (pp. I–LXXV), is devoted to the biology of the grapevine phylloxera.

Natural control of white flies in Florida. A. W. Morrill and E. A. Back (*U. S. Dept. Agr., Bur. Ent. Bul. 102, pp. 78, pls. 9, fig. 1*).—This is a detailed report of investigations commenced in 1906 and extending over a period of 4 years. The subject is taken up under the headings of parasitic and predatory enemies of white flies; snails that feed on sooty mold; climatic conditions; unexplained mortality; dropping from leaves; mortality due to overcrowding; effect of curling and dropping of leaves from drought; bacterial diseases; and fungus diseases.

"No true parasites of these species of white flies are known to exist in this country and their numerous native predatory enemies are usually of no material assistance in their control. Two factors of natural control, overcrowding and unexplained mortality, have heretofore not been recognized or have been confused with the results of attempts at artificial control or with the effects of fungus diseases. The 2 factors named are in effect a reaction from excessive infestation. Bacterial diseases of the white flies are at present unknown but it is not improbable that they are the leading cause of mortality so far unexplained. . . .

"Aside from unexplained mortality, fungus diseases are the most important agents of natural control. The brown fungus (*Ægerita webberi*) and the red Aschersonia (*Aschersonia aleyrodis*) are, in the order named, the most effective parasites of the citrus white fly. The yellow Aschersonia (*A. flavo-citrina*) is the most effective parasite of the cloudy-winged white fly. The cinnamon fungus (*Verticillium heterocladum*) and the Sporotrichum fungus (*Sporotrichum* sp.) are of comparatively little importance. The red-headed scale fungus (*Sphærostilbe coccophila*) is rarely parasitic upon white flies, while the white fringe fungus (*Microcera* sp.) is with little doubt normally saprophytic. The fungus parasites thrive only under suitable weather conditions during a period of about 3 months each year, generally speaking the summer months in the case of the 2 Aschersonias and the fall months in the case of the brown fungus. Their efficacy in destroying white flies under natural conditions is dependent upon the abundance of the insects; a period of excessive abundance always precedes effective temporary control. . . . Under natural conditions, without artificial assistance in spreading, the fungi have ordinarily, in favored localities, controlled the white fly to the extent of about one-third of a complete remedy through a series of years. . . .

"The authors conclude that there are at present no elements of natural control herein dealt with which can be relied upon to give satisfactory results. Under present conditions it is unquestionably more profitable to depend upon artificial remedies."

White fly parasites and their attempted introduction into Florida. R. S. Woglum (*Fla. Grower, 6 (1912), Nos. 9, p. 3; 10, p. 3*).—An address on the attempted introduction of insect enemies of the white fly from India, a brief account of which by L. O. Howard has been previously noted (E. S. R., 25, p. 661).

Some scale insects of Mississippi, with notes on certain species from Texas. G. W. Herrick (*Mississippi Sta. Tech. Bul. 2, pp. 3–78, figs. 96*).—This bulletin discusses the collection and preservation of scale insects, the literature, and the technique to be made use of in preparing them for study, and gives a list of 40 species known to occur in Mississippi, 6 additional from Texas, and 1 from

Louisiana. Technical descriptions and illustrations are presented of 35 of the species.

Mites associated with the oyster-shell scale (Lepidosaphes ulmi), H. E. EWING and R. L. WEBSTER (*Psyche, 19 (1912), No. 4, pp. 121–134, fig. 1*).—Observations made in Iowa in 1911 showed a great variation in the condition of the oyster-shell scale at different places in the State. In some of the infested orchards near Ames, as low as 3.7 per cent of the scales contained sound eggs in the spring of 1911, the remainder being either empty or gutted by mites. Samples of scale collected in an orchard at Northwood, near the Minnesota line, showed that from 23 to 82.4 per cent contained sound eggs. *Hemisarcoptes malus* is said to be the most important enemy of this scale.

Of a total of 9 species of mites found in connection with the oyster-shell scale 6 were either parasitic or predaceous. These 6 species, notes on which are here presented, are *H. malus*, *Tydeus coccophagus*, *Bdella cardinalis*, *Cyta brevipalpa*, *Anystis agilis*, and *Eupalus* sp.

Studies of intracellular symbiosis, P. BUCHNER (*Arch. Protistenk., 26 (1912), No. 1, pp. 116, pls. 12, figs. 29*).—This first paper deals with the intracellular symbiosis of Hemiptera.

Eri silk, H. MAXWELL-LEFROY and C. C. GHOSH (*Mem. Dept. Agr. India, Ent. Ser., 4 (1912), No. 1, pp. 130, pls. 9, figs. 13*).—This paper discusses rearing, diseases, influence of climate, treatment of cocoons, the castor plant, and the eri silk industry in India generally and in Assam.

Orgyia leucostigma: A factor in the causation of Ophthalmia nodosa, G. W. BEATTY (*Med. Rec. [N. Y.], 82 (1912), No. 8, p. 342, fig. 1*).—The author reports cases in which the introduction of hairs from the caterpillars of the white-marked tussock moth produced a nodular condition of the conjunctivæ.

The nun moth problem in Saxony, C. F. C. BEESON (*Quart. Jour. Forestry, 6 (1912), No. 3, pp. 188–194, pl. 1, fig. 1*).—This is a discussion of the present status of the nonne moth situation in Saxony.

Papers on insects affecting vegetables.—A report of progress regarding the sugar beet webworm (Loxostege sticticalis), H. O. MARSH (*U. S. Dept. Agr., Bur. Ent. Bul. 109, pt. 6, pp. 57–70, figs. 15*).—This is a preliminary report based upon observations made by the author during portions of the years 1909 and 1910, and nearly all of 1911, while engaged in investigations of the insects affecting sugar beets and truck crops in the Arkansas Valley of Colorado and Kansas. The injury caused by this pest has varied greatly from year to year.

The moths deposit their eggs singly or in rows of from 2 to 5 or more, usually on the underside of the leaf. Under normal conditions each female is capable of depositing at least 200 eggs. The very young larvæ eat small holes in the underside of the leaves without cutting through the upper epidermis, but as they increase in size they consume almost the entire leaf with the exception of the larger veins and the petioles. When full grown the caterpillars leave the beets and burrow into the soil, usually close about the infested plant, and spin tube-like cases in which they later pupate. During the summer months the moths issue within a few days.

"In rearing experiments conducted at Rocky Ford, Colo., the average time required from the deposition of the eggs until the moths issued was a little more than a month. The egg stage was observed to vary from 3 to 5 days, the larva stage from 17 to 20 days, and the pupa stage was usually 11 days. These variations were from records of successive generations. So far as the writer has been able to determine, there are 3 generations or 'crops' of webworms in the Arkansas Valley each year. There may be a fourth generation, but if so it is not clearly marked and possibly occurs early in the season on weeds such as Russian thistle (*Salsola tragus*) and lamb's quarters (*Chenopodium*

album). . . . In general the danger period extends from shortly before the middle of June until well into September. The first generation of webworms may be expected at its height of destructiveness during the latter half of June, at a time when the beets are comparatively small and least able to resist the attack."

Blackbirds are said to be important enemies of this pest. True parasites in some cases destroy fully 50 per cent of the overwintered larvæ, the braconid *Diosphyrus vulgaris* being one of the most common. Spraying with Paris green at the rate of 3 lbs. to 100 gal. of water to which either 6 lbs. of whale-oil soap or 3 lbs. of lime have been added has proved to be by far the most effective and satisfactory remedy. Zinc arsenite, when used at the rate of 4 lbs. in 100 gal. of water and applied at the rate of 125 gal. per acre, was effective but was noticeably slower than Paris green in its killing effect. It is stated that the cost of labor, material, etc., for spraying sugar beets varied under ordinary circumstances from $1 to $2 per acre. The spraying machinery recommended for use in the work is described and illustrated.

The natural enemies of the cotton worm, L. H. GOUGH (*Agr. Jour. Egypt, 2 (1912), No. 1, pp. 1–3, pl. 1*).—*Calosoma imbricata*, which is parasitized to a very great extent during its larval stage by at least 2 parasitic flies; a Rover beetle (*Paederus* sp.); the gauze-wing fly (*Chrysopa vulgaris*); a solitary wasp (*Eumenes maxillosa*); and *Polistes gallica* are the enemies of the Egyptian cotton worm (*Prodenia litura*) here considered and illustrated in colors.

Methods employed in Egypt and elsewhere to check the ravages of the cotton bollworm, G. C. DUDGEON (*Agr. Jour. Egypt, 1 (1911), No. 1, pp. 40–46*).—This paper relates to *Earias insulana*.

The control of the codling moth, A. L. MELANDER (*Washington Sta. Popular Bul. 45, pp. 8, figs. 7*).—A brief popular account.

Notes on Tineina bred from cotton bolls, J. H. DURRANT (*Bul. Ent. Research, 3 (1912), No. 2, pp. 203–208, figs. 3*).—These notes relate to the pink bollworm (*Gelechia gossypiella*), *Pyroderces simplex*, and *P. rileyi*.

Lepidoptera heterocera; family Geometridæ, L. B. PROUT (*Genera Insectorum, 1912, No. 129, pp. 274, pls. 5, figs. 15*).—The subfamily Hemitheinæ is here dealt with.

New Culicidæ, F. V. THEOBALD (*Novæ Culicidæ. Wye, England, 1911, pt. 1, pp. 35, figs. 21*).—This first part gives descriptions of Culicidæ from Uganda, 13 species being described as new to science.

The rôle of the house fly and certain other insects in the spread of human diseases, W. E. BRITTON (*Pop. Sci. Mo., 81 (1912), No. 1, pp. 36–49, figs. 5*).—An address delivered by the author.

Fruit fly control, W. M. GIFFARD (*Hawaii. Forester and Agr., 9 (1912), No. 5, pp. 166–170*).—This paper adds *Chrysophyllum oliviforme* and *Thevetia nerifolia* to the long list of fruits or seeds infested by the Mediterranean fruit fly.

The petroleum fly in California (Psilopa petrolei), D. L. CRAWFORD (*Pomona Col. Jour. Ent., 4 (1912), No. 2, pp. 687–697, fig. 1*).—A discussion of the habits of this insect and of the structure of the larva.

Blood-sucking Diptera in Venezuela, J. M. R. SURCOUF and R. GONZALEZ-RINCONES (*Essai sur les Diptères Vulnérants du Venezuela. Paris, 1911, pt. 1, pp. V+320, figs. 65*).—This first part of the work deals with the blood-sucking Nematocera.

Blood-sucking Diptera actually known from Venezuela, J. SURCOUF and R. GONZALEZ-RINCONES (*Arch. Par., 15 (1912), No. 2, pp. 248–314, figs. 43*).—This paper relates to the studies noted above.

Peruvian Siphanoptera of Lima and Callao, E. D. TOVAR Y R (*Bol. Dir. Fomento [Peru], 9 (1911), No. 11, pp. 16–37*).—This is a general discussion of the fleas which occur in Peru.

The injurious buprestids, F. PICARD (*Prog. Agr. et Vit. (Ed. l'Est Centre), 33 (1912), No. 31, pp. 133–139, pl. 1*).—Short accounts are given of 6 of the more important buprestids occurring in France, namely, *Sphænoptera gemellata, Corœbus bifasciatus, C. undatus, Chalcophora mariana, Capnodis tenebrionis*, and *Ptosima novemmaculata.*

The bark-eating and root-boring beetles (Coelosterna scabrata and Psiloptera fastuosa) of the babul (Acacia arabica), E. P. STEBBING ([*Indian*] *Forest Bul. 12, 1912, pp. 9, pls. 2*).—Considerable injury in babul plantations in Berar has been due to the attacks of these longicorn and buprestid beetles.

Coleoptera; family Curculionidæ, H. WAGNER (*Genera Insectorum, 1912, No. 130, pp. 109, pls. 6*).—This fascicle takes up the subfamily Apioninæ. A plate showing the distribution of the genera is included.

The plum curculio, A. L. QUAINTANCE and E. L. JENNE (*U. S. Dept. Agr., Bur. Ent. Bul. 103, pp. 250, pls. 20, figs. 36*).—This bulletin gives the results of studies that have been in progress since the spring of 1905. Data have been obtained on the biology of the insect in northern, central, and southern localities in its range of distribution, as in western New York and northwestern Pennsylvania, in the environs of Washington, D. C., and in Georgia. Studies for one season were made in the Ozark region of Arkansas, well toward its limit of occurrence to the Southwest.

The subject is taken up under the headings of classification and synonymy, common names, history, distribution, losses due to the plum curculio, insects likely to be mistaken for it, its description, food plants, life history and habits, seasonal history, percentage of fruit punctured or infested, natural enemies, and remedial measures.

The curculio is indigenous to the eastern United States, and has probably always occupied about its present range of distribution. Investigations conducted show this pest to occur in the humid area in all of the life zones, except the tropical, it having been found as far west as Sterling, Colo. (long. 103°). The authors estimate the annual loss, including cost of remedial operations, resulting from the attack of the curculio, at about $8,500,000.

The plum curculio feeds upon and oviposits in practically all pome and stone fruits, as the apple, pear, quince, plum, peach, cherry, nectarine, and apricot. Certain wild fruits, such as Cratægus, crab apple, etc., are also more or less fed upon, especially when the above mentioned fruits are scarce. There are also records of oviposition in the huckleberry, grape, strawberry, gooseberry, currant, and wild persimmon. It also breeds in black knot.

In comparing the number of eggs deposited by different individuals for the respective localities and the averages of all beetles for a given locality, the authors find a great variation. The final average number of eggs per female for all localities is 144.85, ranging from 1 to 557 eggs. The length of the egg stage ranges from 2½ to 13½ days for the different localities, the averages varying from 3.77 to 9.23 days.

In observations made in Michigan in 1910, the length of the 4 larval instars was 2, 2.4, 2.7, and 4.1 days, respectively. Comparatively few beetles emerge from the soil within 3 weeks from the time of entering as larvæ. The great majority of the beetles appear during the fourth and fifth weeks and by the close of the sixth week emergence has practically ceased. At Barnesville, Ga., the average number of days for the larvæ in the soil before pupation was 16.08 as against 12.03 in Michigan. In Georgia the average time spent by the adults in the ground before emerging was 5.62 days. The average time 37 individuals spent in the soil was 30.89 days. Of a total of 1,083 larvæ, 684 pupated within 1 in. of the surface, and 1,019 within 2 in. of the surface. The several averages of time for complete transformations in the individual records show a range of

from 36.97 to 67.23 days, the former from the insectary records of 1905 at Washington and the latter from Barnesville, Ga., in 1910.

The records indicate that the curculio feeds rather more at night than in the day and that egg laying goes on at about an equal rate during night and day. "It appears that the curculios usually first appear on the trees each season at nearly the same time relative to the advancement of fruit trees, namely, during or a little before the blooming period of apples or shortly after the petals of peaches, pears, and plums have fallen. In some seasons, however, the curculios may appear as early as the blooming period of the plum or be retarded until after apples have shed the petals. Thus it appears that the beetles are affected by temperature to a different degree than are the plants on which they live." A second generation is said to have been reared to the adult stage at Barnesville, Ga., in 1910.

The plum curculio is said to be attacked by several species of parasites, among which the authors consider *Anaphoidea conotracheli*, which parasitizes the eggs, and *Triaspis curculionis*, *T. curculionis rufus*, *Thersilochus conotracheli*, *Microbracon mellitor*, *Myiophasia ænea*, *Cholomyia inaquipes*, and *Pegomya fusciceps*. In discussing remedial measures a historical account of the earlier methods first given is followed by a consideration of the relative value of collecting, spraying, and cultivation for the destruction of the pupæ.

"Considering the several records of jarring on peach given above, it would appear that this practice, on the whole, is not warranted from the benefits derived. Notwithstanding the large total of beetles caught in the course of the Barnesville experiment, averaging 20.81 per tree, there was a lessening of infestation of only about 10 per cent, as compared with the check. . . .

"The records given of results of spraying apples for the control of the curculio indicate clearly that the injuries of the pest may be in all cases greatly reduced, although the degree of benefit varies widely. It is apparent that account must be taken of other factors, as the relative abundance of the insects as compared with the amount of fruit present on the trees. With a small fruit crop and abundance of curculios, the most thorough spraying will not serve to bring through a satisfactory amount of sound fruit. . . . The degree of success in spraying varies with the abundance of the insects, and where the latter are numerous thorough treatments seem to fail to yield a desired freedom from injury." A schedule consisting of 4 sprayings is recommended for apple orchards and should control the plum curculio as well as numerous other insect enemies.

A combination of arsenate of lead and self-boiled lime-sulphur wash, while resulting in important chemical changes, has in actual practice resulted in a spray which appears to be perfectly safe to peach foliage and fruit. Experience during the past 3 years with this combined spray on peaches under varying climatic conditions seems to leave no doubt that by this combination the injurious properties of the arsenate of lead, as when used alone, are so reduced as to be practically negligible. "More data are needed to show the protection from curculio which will follow spraying plums and cherries, though this will without doubt be quite as marked as with peaches. The same spraying schedule indicated for early peaches will be suitable for plums and cherries, and the arsenical should be used in the self-boiled lime-sulphur wash."

A bibliography of economic literature consisting of 23 pages is appended.

Texas bee keeping, L. H. Scholl (*Tex. Dept. Agr. Bul. 24, 1912, pp. 142, figs. 115*).—This bulletin has been prepared by an experienced bee keeper to meet the requirements of those who desire complete practical instructions concerning bee keeping.

Comb honey, G. S. DEMUTH (*U. S. Dept. Agr., Farmers' Bul. 503, pp. 47, figs. 20*).—This bulletin presents an analysis of the best practice and points out some essentials to the production of maximum crops of honey of the best grades.

The subject is taken up under the headings of apparatus for comb-honey production, manipulation of the bees, and caring for the crop.

A successful queen-cage candy made without honey, A. C. MILLER (*La. Planter, 49 (1912), No. 11, p. 185*).—A candy which contains no honey has been prepared for use in queen cages from the following constituents: Granulated sugar, 5 lbs.; coffee A sugar, 1 lb.; glucose, 1 lb.; water, 1½ pt.; and 1 level teaspoonful of cream tartar. After mixing, the ingredients are boiled without stirring until the temperature reaches 240° F. for summer use, or 232° for winter use, then removed from the fire, stirred until thickened, and run into molds, feeders, or cages.

It is stated that queens have been successfully shipped to England and that full colonies shaken from their combs have been shipped with no other food than this candy with the best of results.

South African "fertile-worker bees," G. W. ONIONS (*Agr. Jour. Union So. Africa, 3 (1912), No. 5, pp. 720–728*).—This is a report of personal observations.

South African fertile-worker bees and parthenogenesis, D. S. VAN WARMELO (*Agr. Jour. Union So. Africa, 3 (1912), No. 6, pp. 786–789*).—This is a critical review of the article noted above.

Wild honey: With notes on the Moka bee, E. N. MARAIS (*Agr. Jour. Union So. Africa, 3 (1912), No. 6, pp. 790–795*).—In an appended note by C. B. Hardenberg it is stated that the species here considered, namely, the larger Moka bee, is closely allied to, if not identical with, *Trigona clypeata*.

A new encyrtid (Encyrtus sericophilus) beneficial to sericulture, A. CONTE (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 18, pp. 1182, 1183*).—The encyrtid here described as new to science parasitized the greater number of the pupæ of a tachinid parasite (*Tricholyga sorbillans*) of the silkworm received by the author from Tan Chau, Indo-China.

The life history and bionomics of some North American ticks, W. A. HOOKER, F. C. BISHOPP, and H. P. WOOD (*U. S. Dept. Agr., Bur. Ent. Bul. 106, pp. 239, pls. 15, figs. 17*).—This is a report of studies conducted in large part in the field laboratory of the Bureau of Entomology at Dallas, Tex., from 1907 to 1910. The first part of the bulletin is devoted to an account of ticks in general, including systematic position and classification; collecting, preserving, and mounting; economic importance; history of the biological study of ticks; geographical distribution; general life history; habits; multiplication; locomotion and dissemination; seasonal history; methods employed in studies of ticks; natural control; and artificial control.

The life history and bionomics of 19 forms are considered. Under each species the authors present a description of the size and coloration of the various stages, their host relationship, geographical distribution, observations of the length of the various stages, number of eggs deposited, etc., based upon temperature readings, a summarized account of the life cycle, economic importance, and natural and artificial control. The species and varieties thus considered are the fowl tick (*Argas miniatus*), spinose ear tick (*Ornithodoros megnini*), black-legged tick (*Ixodes scapularis*), rotund tick (*I. kingi*), rabbit tick (*Hæmaphysalis leporis-palustris*), bird tick (*H. chordeilis*), brown dog tick (*Rhipicephalus sanguineus*), North American cattle tick (*Margaropus annulatus*), Australian cattle tick (*M. annulatus australis*), gopher-tortoise tick (*Amblyomma tuberculatum*), iguana tick (*A. dissimile*), Gulf Coast tick

(*A. maculatum*), lone star tick (*A. americanum*), cayenne tick (*A. cajennense*), rabbit Dermacentor (*Dermacentor parumapertus marginatus*), Rocky Mountain spotted-fever tick (*D. venustus*), Pacific Coast tick (*D. occidentalis*), American dog tick (*D. variabilis*), and tropical horse tick (*D. nitens*).

A list of bibliographical references is appended.

Rocky Mountain spotted fever, W. C. RUCKER (*Pub. Health and Mar. Hosp. Serv. U. S., Pub. Health Rpts., 27 (1912), No. 36, pp. 1465–1482*).—This summarized account includes a bibliography of 77 titles.

The origin and significance of parasitism in the Acarina, H. E. EWING (*Trans. Acad. Sci. St. Louis, 21 (1912), No. 1, pp. 70, pls. 8*).—"We have very strong evidence indicating that the parasitic habit has originated independently at least 11 times in the phylogeny of the Acarina. Among the zoophagous parasites the parasitic habit has been developed from 3 different types of free living Acarina: (a) Predaceous forms, (b) scavengers, (c) forms living upon the juices of plants. . . . As is usually the case with other parasites, we generally find here a gradual increase in the state of degeneration as we follow the advancing stages of parasitism from its origin among free types. . . . We find in the Acarina a process of degeneration which in its completeness is seldom obtained in the animal kingdom."

FOODS—HUMAN NUTRITION.

Sewage-polluted oysters as a cause of typhoid and other gastro-intestinal disturbances—a study of an epidemic and of certain individual cases, G. W. STILES (*U. S. Dept. Agr., Bur. Chem. Bul. 156, pp. 44, pls. 4, figs. 7*).—According to the author's conclusions from his investigations and a summary of data, "there is undisputed evidence to show that infected oysters, clams, mussels, scallops, and other shellfish may cause typhoid fever and other gastro-intestinal disturbances when consumed by susceptible individuals.

"The epidemics of typhoid fever, due to ingestion of polluted sea food, have in most instances been traced to shellfish floated in polluted water, although there is also evidence that oysters and other shellfish, grown in polluted waters and directly consumed without transplanting for a time in pure waters, may be the source of typhoid infection."

A full account is given of investigations which led to the conclusion that Rockaway oysters were wholly responsible for cases of typhoid fever and gastro-enteritis (diarrhea) following a banquet. There were 17 well-defined cases of typhoid fever, with 1 death, and 83 cases of gastro-enteritis traced directly to such oysters from Jamaica Bay, floated at Indian Creek, near Canarsie, Long Island, N. Y., with 10 additional cases of typhoid and 16 cases of diarrhea traced to oysters from the same locality and in part from the same lot as those furnished for the banquet.

"This investigation comprises a complete study of all the factors which would materially contribute to typhoid infection. Each item of the menu served at the . . . banquet was carefully considered, and the Rockaway oysters served were the only articles of food consumed by all of those who had typhoid or gastro-enteritis following this banquet."

Bacteriological studies showed sewage pollution in Jamaica Bay, and "typhoid bacilli were isolated in pure culture after 7 and 21 days from oysters which had been floated at Inwood, Long Island, N. Y., . . . and kept out of water in storage at 39° F. Organisms of the *Bacillus coli* and *B. paratyphosus* groups were also isolated from oysters floated at Indian Creek. . . . They were probably the cause of the gastro-enteritis cases following the . . . banquet."

The diarrhea or bowel trouble referred to, according to the author's conclusions, can probably be ascribed to the presence of paratyphoid bacilli (said by

some authors to be indistinguishable from or closely allied to the Gaertner bacillus) in the oysters served at the banquet. "It is apparent that the disease was due to bacterial infection, arising from the multiplication of the organisms in the body after ingestion, and not to 'ptomaines,' as suggested by some.

"Ptomaines are formed most commonly during the decay of animal matter. They are essentially the decomposed animal tissue, not excretions of the bacteria, although the bacteria are responsible for the decomposition. Such decomposition does not occur usually in the body, even in animal matter taken as food. In abnormal conditions, if food remains in the body until putrefied, ptomaines may be formed in the intestinal contents. When decomposed food containing ptomaines is received in the digestive tract, or originally good food decomposes there, the mucous membrane and blood may take up ptomaines from this decomposed food, which ptomaines affect the tissues like other poisons.

"Substances of quite varied chemical constitution are classed under the head of ptomaines solely on account of their origin in proteid decomposed by bacterial action. Bacterial toxins are to be distinguished from ptomaines. Toxins are substances which are or have been a part of the body of the bacteria; some are secretions from the germ, others are liberated only in case of the death and breaking down of the germ itself. In this latter class is the toxin of typhoid fever, which is therefore particularly different in its origin and action from ptomaines. The toxins are much more poisonous than ptomaines and each one is produced by a specific germ.

"Some cases of sickness due to food have been classed as ptomaine poisoning, when this cause was later discovered to be the ingestion in the food of a particular bacillus which multiplied in the body and by its toxin produced intestinal and other disturbances. Such cases are not ptomaine poisoning but may be classed as food poisoning."

Studies of meat corned by the Morgan process, K. von Karaffa-Korbutt (*Ztschr. Untersuch. Nahr. u. Genussmtl., 24 (1912), No. 6, pp. 365–385*).—From an experimental study of this method of pickling meat and a summary of published data, general conclusions were drawn including, among others, the following:

The method of pickling the meat is not less important than its further treatment. Ripening should take place in rooms with a temperature of about 0° C. It requires from 4 to 6 weeks in order that the osmotic processes may be completed and the meat be uniformly salted. Storing corned meat for a sufficient time at a low temperature improves its keeping quality. The relation between the temperature of storerooms and the spoiling of pickled meat lies in the symbiosis of different bacteria which gain access to it. Low temperature favors the development of yeast forms and acidophylic bacteria and lessens the growth of septic bacteria, and it is therefore a favorable factor in keeping quality.

On the falsification of the rice, S. Sato (*Yakugakuzasshi (Jour. Pharm. Soc. Japan), 1912, No. 361, pp. 217–241, figs. 3*).—It is stated that fine gravel and siliceous earth are added to rice as an adulterant as well as to assist in removing the hulls. The percentage of ash in such cases may be as high as 6.36 per cent, while good rice should have less than 1 per cent of ash.

The milling quality of Washington wheats, III, R. W. Thatcher (*Washington Sta. Popular Bul. 39, pp. 8*).—A summary of data previously noted (E. S. R. 25, p. 857).

How to make bread from soft wheat flours, G. A. Olson (*Washington Sta. Popular Bul. 47, pp. 4, fig. 1*).—Directions are given for preparing yeast and for mixing and handling the dough from Washington soft wheat flours.

The author insists that ingredients should be weighed. Directions are given for determining the amount of water required by different flours, and some data presented showing the influence of water and kneading on the size and texture of the loaf. According to the data presented, there is always an increase in the weight of bread and volume of loaf with a reasonable increase of water used in mixing the dough, while at the same time there is a reduction in the time required for fermentation and baking. When straight doughs are compared with those involving kneading "it is observed that the weight of the loaf is practically the same in all cases when like amounts of water were used. The largest weights were obtained where the flour was kneaded the second time." The smallest volume was obtained in the case of straight dough where the minimum amount of water (52.5 per cent) was used and the largest volume in the case of lightly handled dough with a second kneading where 65.5 per cent of water was used.

Bulgarian bread, a little known dough fermentation (*Pure Products, 8 (1912), No. 7, pp. 384, 385*).—The bread here described is made of fine wheat flour and leavened by the activity of a bacillus of the Coli group, called *B. macedonicus*. The bread is said to have a pleasant taste and a fine, fruity aroma.

Concerning the physiological effect of chicory infusion, J. PAECHTNER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 23 (1912), No. 6, pp. 241–250, dgms. 6*).—From experiments with a rabbit and dogs the author concludes that chicory exercises a noticeable though not very great stimulating effect upon the digestive apparatus and the circulation of the blood, and that this rather than the taste explains the general use of this material as a food accessory. He does not believe that under normal conditions there is any reason for considering chicory harmful.

Food inspection decision (*U. S. Dept. Agr., Food Insp. Decision 148, pp. 2*).—The use of copper salts in the greening of foods is declared an adulteration under the Food and Drugs Act after January 1, 1913.

Sulphite in sugar goods, H. WITTE (*Ztschr. Untersuch. Nahr. u. Genussmtl., 24 (1912), No. 7, pp. 463–465*).—The occurrence of sulphurous acid in candies is reported and discussed.

The art of good living, E. RICHARDIN (*L'Art du Bien Manger. Paris, 1910, pp. XVI+a+926, pls. 51, figs. 51*).—In this volume, which bears the subtitle French Cookery from the Fourteenth to the Twentieth Century, a large amount of historical and general data regarding food and its preparation is summarized and many recipes are included.

Good living (*Pour Bien Manger. Paris, 1912, pp. XXXII+340, pls. 24, figs. 43*).—This volume discusses at length cooking schools, kitchen equipment, service, and other matters of housekeeping, and gives a large number of recipes for preparing different foods. Data are also summarized regarding the adulteration of food.

Beriberi caused by fine white flour, J. M. LITTLE (*Jour. Amer. Med. Assoc., 58 (1912), No. 26, pp. 2029, 2030*).—A diet consisting almost exclusively of fine white flour, tea, and molasses, made necessary by shortage of food supplies in Newfoundland and Labrador, resulted in beriberi, according to the author's experience.

Substitution of whole wheat flour is recommended. He believes that the more the diet is restricted to flour, the more necessary it is to have whole wheat flour.

Preparation from yeast and certain foodstuffs of the substance the deficiency of which in diet occasions polyneuritis in birds, C. FUNK (*Jour. Physiol., 45 (1912), No. 1–2, pp. 75–81; abs. Jour. Chem. Soc. [London], 102*

(*1912*), *No. 599, II, p. 856*).—A substance which appears to be a pyrimidin base, forming a constituent of nucleic acid, was isolated from yeast, milk, brain, and possibly lime juice. From 0.02 to 0.04 gm. in food prevented polyneuritis in pigeons.

The influence of meal hours upon energy elimination in man, J. AMAR (*Compt. Rend. Acad. Sci.* [*Paris*], *154* (*1912*), *No. 8, pp. 528–531; Jour. Physiol. et Path. Gén., 14* (*1912*), *No. 2, pp. 298–308; abs. in Zentbl. Expt. Med., 1* (*1912*), *No. 14, pp. 634, 635; Zentbl. Physiol., 26* (*1912*), *No. 7, pp. 351, 352*).—In these experiments the effect on the respiratory quotient and oxygen consumption of carbohydrate as compared with nitrogenous food, and of a constant amount of work performed at different intervals after ingestion of food was noted.

The author concludes that the performance of a given amount of work is 4.5 per cent more difficult and that the energy is available much more slowly on a nitrogenous than on a carbohydrate diet.

The influence of dry and moist air on gaseous metabolism, H. MURSCHHAUSER and H. HIDDING (*Biochem. Ztschr., 42* (*1912*), *No. 5, pp. 357–371; abs. in Jour. Chem. Soc.* [*London*], *102* (*1912*), *No. 599, II, p. 850*).—Experiments were made to determine the effect of humidity on gaseous metabolism, using guinea pigs.

At 5° C. there was 76.5 per cent more of carbon dioxid in dry air, and 82.8 per cent more in moist air, than at 21°. There was 18.7 per cent less carbon dioxid in dry air, and 7.1 per cent more in moist air, at 35° than at 21°. Carbon dioxid metabolism at 21° is greater in dry than in moist air.

The author's explanation of the observed facts is that the lower the temperature, the greater the degree of saturation with water vapor, and consequently the less the loss of body heat. Increase of moisture diminishes carbon dioxid production, while decrease of moisture has the opposite effect. At higher temperatures, increase in moisture content up to the point of saturation is associated with increased body temperature, indicating increased metabolism. The results in relation to size of body surface are discussed.

ANIMAL PRODUCTION.

The nature, origin, and maintenance of life, E. A. SHÄFER (*Nature* [*London*], *90* (*1912*), *No. 2236, pp. 7–19; Sci. Amer. Sup., 74* (*1912*), *Nos. 1918, pp. 221–223; 1919, pp. 226, 227; 1920, pp. 254, 255*).—This is the inaugural address of the president of the British Association for the Advancement of Science, 1912, and discusses the fundamental principles governing the origin, growth, and maintenance of animals and plants as revealed by physical, chemical, and biological studies.

The process of reproduction in organisms, C. M. CHILD (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 23* (*1912*), *No. 1, pp. 1–39*).—A discussion of the reproductive power of both somatic and germ cells.

It is stated that the experimental data of recent years do not support the germ plasm hypothesis of Weismann. The view is also expressed that our theories of heredity, instead of being based solely on the phenomena of sexual reproduction, must find their basis for analysis and interpretation in the simpler forms of asexual and experimental reproduction. Heredity is defined as the capacity of the physiologically or physically isolated part for regulation.

The interstitial cells and the supposed internal secretion of the chicken testis, ALICE M. BORING (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 23* (*1912*), *No. 3, pp. 141–153, figs. 9*).—The object of this work was to find evidence of the reproductive organs as a cause for the development of secondary characters,

the male fowl being an especially good animal because of the extensive development of the characters to be studied.

The histological studies revealed no cells in the interstitial tissue in the young or old chicken testis with the cell bodies differentiated from the connective tissue fibers. The differences in shape depended on the mechanical pressure conditions. The difference in staining capacity of the nuclei was not considered a basis for cell classification. The fat in the testis was thought to be brought there by the circulation and deposited, instead of being formed by the interstitial tissue. No evidence was found in this study which would indicate an internal secretion of any kind formed by interstitial tissue. Therefore, it is concluded that there is no interstitial cell in the testis of the domestic chicken in the sense that the term has been previously used.

The iron content of the urine of domesticated animals, M. REICH (*Das Harneisen der Haustiere. Inaug. Diss., Univ. Rostock, 1911, pp. 41; rev. in Zentbl. Agr. Chem., 41 (1912), No. 4, pp. 272–275*).—In normal feeding the amount of iron excreted per kilogram of urine was as follows: Dogs from 1.1 to 1.42, swine from 1.3 to 1.58, oxen 0.918, goats 0.498, horses from 0.51 to 0.83, and sheep from 0.73 to 1.34 mg. The amount excreted per day for animals was as follows: Dog 0.33, swine 5, oxen 12.55, goats 0.5, and sheep 1 mg. As in the case of man the iron was in inorganic compounds.

The discordant results of many investigators is thought to be due to imperfect methods of determination. The author used a modification of the methods of O. Walter and H. Neumann.

Department of experimental evolution, C. B. DAVENPORT (*Carnegie Inst. Washington Year Book, 10 (1911), pp. 78–87, pl. 1*).—A report of progress made on problems in heredity, evolution, and genetics, including work on the following topics: Heredity in poultry, inheritance of double horn in sheep, reciprocal crosses in relation to sex, theory of pure lines, quantitative studies of selective elimination, influence of becoming feral on the development of the nervous system of the domestic animal, and the relation between heredity and the chemical action of pigment.

The problem of the improvement of domesticated species, H. BOULARD (*Bul. Écon. Indo-Chine, n. ser., 15 (1912), No. 97, pp. 479–491*).—A discussion of methods of selecting breeding animals, and brief notes concerning the ancestry of cattle.

Production of pure homozygotic organisms from heterozygotes by self-fertilization, H. S. JENNINGS (*Amer. Nat., 46 (1912), No. 548, pp. 487–491*).—The author illustrates with mathematical formulas how organisms may become homozygotes when self-fertilized for many generations, if the number of separable inheritable characters is not large.

The formation of condensed correlation tables when the number of combinations is large, J. A. HARRIS (*Amer. Nat., 46 (1912), No. 548, pp. 477–486*).—The author's aim in this article is to show how, in the case of relationships involving a very large number of combinations, the chief advantages of the correlation, but not the contingency, surface may be even more easily realized than in the method already described (E. S. R., 25, p. 771). Illustrations are given of this rapid method of carrying out the routine of a widely applicable statistical process.

Concerning a specimen of Bos primigenius, J. FELIX (*Sitzber. Naturf. Gesell. Leipzig, 37 (1910), pp. 35–38, pl. 1*).—This contains a description of measurements of a perfect skull of *B. primigenius*.

Progress in breeding in the State of Sao Paulo, Brazil, L. MISSON (*Ann. Gembloux, 22 (1912), No. 8, pp. 458–508, pls. 24*).—A general account of the

live-stock industry of Sao Paulo. Methods of feeding, breeding, and management are described, and a list of the principal forage plants and their yields per acre is also given.

Live-stock industry [of southern India], J. DE OLIVARES (*Daily Cons. and Trade Rpts. [U. S.], 15 (1912), No. 241, pp. 211, 212*).—This contains some statistics on the rapid development of the live-stock industry in southern India. This is attributed to various causes, chief of which are the greatly increased feeding resources resulting from extensive irrigation and the successful work of veterinarians in checking diseases to which cattle are subject.

Managing and equipping a two-hundred-acre stock farm, M. P. JARNAGIN (*Tenn. Agr., 1 (1912), No. 4, pp. 147–161, figs. 10*).—A system of live-stock farming is outlined, which includes data as to the amount of feed required for farm animals, the rotation of crops, and other points relating to the successful management of a live-stock farm.

Our knowledge of the carbohydrates in the economy of the animal, R. LÉPINE (*Rev. Gén. Sci., 23 (1912), No. 12, pp. 463–468*).—This is a historical résumé of the growth of the knowledge on carbohydrate metabolism.

The effect of sugar on metabolism, A. GOUIN and R. ANDOUARD (*Compt. Rend. Soc. Biol. [Paris], 72 (1912), No. 26, pp. 113–115*).—An experiment with a 1½-year-old heifer, which lasted for 7 weeks. During the whole period the daily ration consisted of 800 gm. of peanut cake and hay ad libitum, and, in addition, during the first 3 weeks, potatoes; during the next 2 weeks one-half of the potatoes was replaced with carob beans; and during the last 2 weeks carob beans equal in nutrients to the potatoes fed at first. During the second period the potatoes and carob beans furnished 128 gm. saccharose daily, and during the third period the carob beans furnished 218 gm. saccharose daily.

There was a great reduction in the secretion of urine and urinary nitrogen and in general in the percentage of nutrients digested on addition of saccharose to the rations. The daily increase in weight was for the first period 501 gm., for the second period 1,000 gm., and for the third period 857 gm. The experiment will be repeated with a younger animal.

Investigations on the meadow conditions of German Southwest Africa, W. HEERING and C. GRIMME (*Arb. Deut. Landw. Gesell., 1911, No. 197, pp. 143*).—A study of the soil types and geographical distribution of grasses and forage plants. Analyses and digestion coefficients of the following species are reported: *Aristida uniplumis, A. congesta, A. stipiformis, A. namaquensis, Cyathula hererœnsis, Crotalaria diversistipula, Tribulus terrestris, T. inermis, T. pechuelii, Andropogon contortus, A. papillosus, Panicum trichopus, Sporobolus indicus, S. nebulosus, Eragrostis trichophora* var., *E. porosa, E. lævissima, Cynodon dactylon, Anthephora hochstetteri, Fingerhuthia africana, Asparagus* sp., *Boerhavia pentandra, Albizzia anthelmintica, Acacia hebeclada, A. hererœnsis, A. giraffæ, Rhynchosia gibba, Peltophorum africanum, Commiphora africana, Croton gratissimus, Flueggea abovata, Heeria mucronata, Rhus ciliata, R. albomarginata, Helinus ovatus, Grewia bicolor, G. olukondæ, Combretum hererœnse, C. primigenium, Royena pallens* (?), *Ehretia hottentottiea, Bouchea pinnatifida, Solanum incanum, Pctalidium physaloides, Blepharis edulis* (?), *Cucumis prophetarum* var., *Tarchonanthus camphoratus, Dicoma anomela, Nidorella auriculata, Cyperus usitatus, Citrullus vulgaris, Citrullus* sp., *Schmidtia pappophoroides, Poponarthria tuberculata, Leucosphœra bainesii, Hermbstœdtia dammarensis, Cleome rubella, Polanisia lüderitziana, Lotononis* sp., *Tephrosia purpurea, Rhigozum trichotomum, Catophractes alexandri, Pappophorum cenchroides, P. scabrum, Salsola aphylla* (?), *Zygophyllum affine microcarpun, Aitonia capensis, Leucas pechuelii, Setaria verticillata, Chloris*

virgata, Atriplex vesicaria, Kochia salsoloides (?), *Anisostigma schenckii*, and *Tamarix usneoides*.

The common names of these plants are given in German.

Report of the animal husbandman, E. G. RITZMAN (*Porto Rico Sta. Rpt. 1911, pp. 40–44*).—This contains a brief account of zebu crosses, African woolless sheep, and other station work in relation to animal husbandry.

Three years' investigation indicates that good silage can be made, and that native stock as well as the imported animals will eat it readily. Corn, whole cane, cane tops, and malojilla or Para grass have all given satisfactory results when fed as silage. Para grass when put in the silo was so light that it did not make good silage unless heavily ballasted. Six ft. of cut corn silage made a satisfactory ballast.

It was found that calcium chlorid could be used profitably as a supplement to bone meal in rations deficient in calcium. Middlings, shorts, and other mill feeds poor in calcium were too high in magnesium, and this excess of magnesium retarded assimilation and increased the cost of growth unless the effect was neutralized by calcium. Comparisons of calcium chlorid with tricalcium phosphate (bone meal) showed that there was only a small variation among individual pigs in utilization of calcium chlorid whereas there was a wide difference among individual pigs as regards utilization of bone meal.

Silos and silage, R. C. ASHBY (*Washington Sta. Popular Bul. 46, pp. 4*).—This discusses the advantages of including silage in the ration for live stock, and gives estimates on the cost of raising silage crops and building silos.

Feeding stuffs inspection for 1912, B. E. CURRY and T. O. SMITH (*New Hampshire Sta. Bul. 158, pp. 30*).—This contains the results of the annual feeding stuffs inspection, including analyses of 267 samples of cotton-seed meal, linseed meal, beef scraps, bone meal, cob meal, shredded wheat waste, corn-oil meal, buckwheat middlings, distillers' dried grains, malt sprouts, dried beet pulp, rye grains, gluten feed, hominy feed, wheat bran, wheat middlings, alfalfa meal, and proprietary mixed feeds. A discussion showing the expensive nature of low-grade feeds is also given.

Feeding stuffs, F. MACH (*Ber. Grossh. Bad. Landw. Vers. Anst. Augustenb., 1911, pp. 18–32*).—Analyses are reported of peanut cake, coconut cake, linseed cake, maize-oil cake, poppy cake, palm-nut cake, rape cake, sesame cake, soybean cake, wheat bran, wheat germ, distillers' slop, maize, fresh unshelled acorns, dried shelled acorns, dried sugar beet leaves, meat meal, fish meal, potato flakes, sugar-beet flakes, and apple pomace.

The microscopic identification of cattle foods, G. H. CHAPMAN (*Massachusetts Sta. Bul. 141, pp. 4–71, figs. 52*).—This bulletin contains brief descriptions of the characteristics of grains and grain products, legumes and oil seeds, weed seeds, and miscellaneous products, condiments, chemicals, and miscellaneous substances commonly found in commercial feeding stuffs, so that the ingredients can be easily identified by means of the microscope.

The text is accompanied by figures showing microscopic sections of cells, starch grains, etc. An analytical key to some commonly occurring starches is included.

Corn silage and roots for steers, J. W. WILSON (*South Dakota Sta. Bul. 137, pp. 354–367, figs. 11*).—This bulletin gives the results of 2 experiments in feeding corn silage to steers.

In the first experiment 20 yearling steers were divided into 5 lots of 4 each and fed for 90 days in order to test silage as a sole ration for wintering steers, as follows: Lot 1, silage from green corn cut when in the dent stage; lot 2, one-half as much silage as was consumed by lot 1 and all the hay they would eat; lot 3, silage from corn fodder cut at the same time as for lot 1 but put

into silo 10 weeks after it was cut; lot 4, millet hay cut when green and before seed matured; and lot 5, corn fodder from the field.

In the second experiment 24 yearling steers were divided into 6 lots of 4 each and fed for 120 days corn and oil meal 10:1, as a basal ration, and in addition the following: Lot 6, silage; lot 7, one-half as much silage as lot 1 and what hay they would eat; lot 8, sugar beets and hay; lot 9, mangel wurzel beets and hay; lot 10, stock beets and hay; and lot 11, hay.

The following table gives the comparative gains made in these tests:

Comparative gains of yearling steers on silage with and without supplements.

Experiment 1.			Experiment 2.			
Lot.	Average weight at beginning.	Average daily gain per head.	Lot.	Average weight at beginning.	Average daily gain per head.	Pork produced following steers.
	Lbs.	*Lbs.*		*Lbs.*	*Lbs.*	*Lbs.*
1	773	2.40	6	807	2.36	169
2	757	1.25	7	835	2.54	224
3	780	1.94	8	793	2.55	203
4	786	.63	9	773	2.61	190
5	765	1.76	10	798	2.39	157
			11	837	2.28	207

Experiments on the feeding of cattle, C. B. JONES (*Univ. Col. Wales, Agr. Dept. Bul. 1 [1912], pp. 1–12*).—In an experiment with 12 Hereford and 8 Welsh Black 3-year-old cattle for 16 weeks the average daily gain per head for the lot fed 6 lbs. cotton-seed cake and barley meal daily was 1.55 lbs. against 1.6 lbs. for the lot fed 3½ lbs. of the same concentrates daily, the supplementary feeds in each case being straw, hay, and 50 lbs. of roots. In another experiment, in which the cattle were fed rations similar to the last-mentioned lot for 16 weeks, those allowed free access to water gained 1.92 lbs. each daily against 0.87 lbs. for those receiving no water except that contained in the feed.

Loss in weight of fattened cattle, HERTER and WILSDORF (*Arb. Deut. Landw. Gesell., 1911, No. 182, pp. 42; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 4, pp. 970, 971*).—This gives the loss in weight of calves, bulls, and cows at different ages when shipped from all parts of Germany to the Berlin cattle show.

The Bordelaise breed of cattle, G. LAFFORGUE (*Vie Agr. et Rurale, 1912, No. 13, pp. 331–334, figs. 4*).—The characteristics of this French breed of cattle are illustrated and described.

The development of Bavarian cattle breeding, C. KRONACHER (*Die Entwicklung der Baverischen Rindvichzucht. Hannover, 1911, pp. 96, fig. 56; abs. in Fühling's Landw. Ztg., 60 (1911), No. 19, p. 680*).—A history of cattle breeding in Bavaria since the organization of the agricultural union a century ago.

Swiss cattle, J. DE LHARPE (*Ann. Gembloux, 22 (1912), No. 7, pp. 424–435, pls. 3*).—The Swiss breeds of cattle are illustrated and described.

Sheep and wool for the farmers.—I, The cross-breeding of sheep, J. W. MATHEWS (*Dept. Agr. N. S. Wales, Farmers' Bul. 53, 1912, pp. 126, figs. 56*).—This bulletin treats of the classification of sheep breeds, principles of breeding, influence of climate upon breed, suitability of the breeds for different localities, wool production, the raising of early lambs, management of sheep, cross-bred *v.* Merino stock, and the standardization of the cross-breds.

Sheep breeding in East Friesland, GROSS (*Illus. Landw. Ztg., 32 (1912), No. 49, pp. 457–459; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel.*

and Plant Diseases, 3 (1912), No. 8, p. 1817).—The characteristics of the East Friesland milk sheep are discussed, and there is a general account of the recent efforts to improve the breed.

A comparison of sheep branding paints, C. J. OVIATT (*Wyoming Sta. Bul. 93, pp. 8, figs. 6*).—This bulletin reports the results of tests for the purpose of ascertaining the comparative efficiency, durability, and scouring-out qualities of several commercial brands of sheep branding paints.

Paints remained a greater length of time on downs and fine wools than on coarse wool. The fineness of the wool had no effect on the scouring-out qualities of the paints. It is stated that if all wool growers would use a scourable paint the labor of clipping brands from the fleeces in the mills would be eliminated and this saving could be added to the price of wool.

"A paint made of Venetian red or lamp black as pigments mixed with linseed oil is much more durable than the prepared paints tested. The right consistency may be obtained by the addition of turpentine."

Heredity in goats, C. J. DAVIES (*Mendel Jour., 1912, No. 3, pp. 104–116, figs. 6*).—Data are presented from herd books of the British Goat Society on the inheritance of horns and hair.

Dried yeast as a food for fattening swine, W. VÖLK (*Ztschr. Spiritusindus., 35 (1912), Nos. 1, pp. 1, 2; 2, pp. 14, 15; 3, pp. 25, 26; 4, p. 38; 5, pp. 48, 49; Wchnschr. Brau., 28 (1911), Nos. 45, pp. 537–541; 46, pp. 550–556, figs. 3; abs. in Chem. Zentbl., 1912, I, No. 7, p. 515*).—The average daily gain of 9 pigs for 7½ months on a ration of dried yeast, potatoes, and barley was about 0.77 kg. (1.69 lbs. per head per day at a cost of 0.545 marks (13 cts.) per day. Analyses of feeds and the slaughter weights of different organs are given.

Swine fattening experiments with soy-bean meal, E. HASELHOFF (*Fühling's Landw. Ztg., 61 (1912), No. 12, pp. 401–414*).—Soy-bean meal was found to be somewhat cheaper than barley meal as a feed for swine when given with a variety of other feeds. Studies of the fat showed that soy-bean meal had no great effect on the index of refraction, saponification number, or iodin number.

Fattening pigs, J. W. WILSON (*South Dakota Sta. Bul. 136, pp. 339–359, fig. 1*).—To determine the comparative value of buttermilk, sweet skim milk, and sour skim milk when fed in connection with corn, experiments were conducted during the summers of 1910 and 1911. In 1910 24 pigs averaging 92 lbs. each were fed for 62 days rations consisting of about 2½ lbs. of milk for every pound of shelled corn. An equal number of pigs averaging 93 lbs. each were fed 62 days in 1911, about 3 lbs. of milk for every pound of shelled corn. Each year a lot was fed on shelled corn without milk as a check lot. All pigs had an abundance of blue grass pasture. The pigs consisted of pure bred Poland-Chinas, Duroc-Jerseys, Berkshires, and Hampshires, and grade Duroc-Jerseys. Averaging both experiments, the lot fed shelled corn made a daily gain of 1.04 lbs. each, and consumed 4.68 lbs. corn per pound of gain. Those fed shelled corn and sweet skim milk gained 1.65 lbs. each daily, requiring 3.12 lbs. of grain and 8.59 lbs. of milk per pound of gain. The lots on corn and sour skim milk gained 1.64 lbs. each daily, requiring 3.18 lbs. grain and 8.72 lbs. milk per pound of gain. The corn and buttermilk lots made a gain of 1.66 lbs. each daily, requiring 3.15 lbs. grain and 8.64 lbs. milk per pound of gain.

Another experiment was conducted to determine the practical value of the "hog motor" for fattening pigs. The hog motor is a machine with a pair of burrs so constructed that the pig is compelled to grind the grain before he receives it. In 1911 8 pigs, averaging a little over 200 lbs. each, were divided into 2 lots of 4 each and placed in yards with access to a good rape pasture. In one lot was placed the hog motor filled with shelled corn and in the other lot was placed a self-feeder filled with corn meal. The test lasted 61 days.

The hog-motor lot made an average daily gain of 1.49 lbs. each, requiring 5.63 lbs. grain per pound of gain. The self-feeder lot made an average daily gain of 1.56 lbs. each, requiring 5.72 lbs. grain per pound of gain.

The feeding of pigs, C. B. JONES (*Univ. Col. Wales, Agr. Dept. Bul. 1 [1912], pp. 14, 15*).—In an experiment with 6 pigs which lasted about 6 weeks the 3 fed boiled potatoes gained 25 lbs. more than the 3 fed raw potatoes with otherwise similar rations. When the cost of cooking, however, was added the actual gain in money for cooked potatoes was small.

[Swine breeding], SCHROEDER ET AL. (*Illus. Landw. Ztg., 32 (1912), No. 75, pp. 685–698, pl. 1, figs. 293*).—This number is devoted especially to swine breeding, containing several articles on methods practiced by swine breeders in different parts of Germany, the cost of pork production, and related topics.

On ovariotomy in sows, with observations on the mammary glands and the internal genital organs, R. J. J. MACKENZIE and F. H. A. MARSHALL (*Jour. Agr. Sci., 4 (1912), No. 4, pp. 410–420, pls. 2*).—Observations upon sows confirm the view that the ovaries are an essential factor in mammary growth, or at any rate in such mammary growth as occurs in nonpregnant animals. The mammary glands apparently undergo cyclical changes corresponding to those which take place in the internal generative organs during the estrous cycle. Changes taking place in the tissues of the mammary region in sows during heat consisted mainly of a congestion of the glands. These changes are of much importance because the part affected in the pig is of much commercial value, there being considerable loss in the quality of the bacon when animals are killed for meat during this period.

In black pigs the case was found to be complicated because of the occurrence of melanic pigment in the mammary region, but as far as the authors were able to determine this pigment is not derived from extravasated blood and has no connection with the occurrence of heat. The pigment is probably similar in kind to the melanic pigment of the hair, and the bacon manufacturer who wishes to differentiate between sows slaughtered at this period and other sows can not rely upon this pigment as a guide. Since ovulation occurs during estrum and not during proestrum it is advisable to hog the sow during the end of the period, and the practice of turning the boar loose to a considerable number of sows is deprecated.

Curing of Italian hams, J. A. SMITH ET AL. (*Daily Cons. and Trade Rpts. [U. S.], 15 (1912), No. 249, pp. 385–388*).—This describes the various methods of curing hams in different parts of Italy.

Studies on horse breeding, R. MOTLOCH (*Studien über Pferdezucht. Hannover, 1911, pp. VIII+125, figs. 13; abs. in Zentbl. Agr. Chem., 41 (1912), No. 8, pp. 573, 574*).—This discusses inheritance, inbreeding, early maturing, and related problems, based largely on experience in breeding horses in Hungary.

A brief study on the breeding of army horses in Sao Paulo, A. FOMM (*Criador Paulista, 7 (1912), No. 62, pp. 1289–1306, figs. 17*).—A discussion of the type of horses needed for the Brazilian army, and methods of improvement by proper selection of breeding stock.

The Zmudian horse, I. VON MORACZEWSKI (*Mitt. Landw. Inst. Breslau, 6 (1912), No. 4, pp. 563–600, fig. 1*).—A history, characteristics, and measurements are given of the native horse of Zmudz (Samogitia).

The heredity of racing stamina in the thoroughbred horse, J. B. ROBERTSON (*Mendel Jour., 1912, No. 3, pp. 37–92*).—A discussion of the physiological properties of the muscle and to what extent they are inherited. There is also a Mendelian analysis of data gathered from racing calendars and stud books in regard to types of race horses, the relative staying power of mares and horses,

the essential qualities of a "stayer," and the severity of the race-course test as a selective agent.

The author states that dark red striated muscle is correlated with a capacity for long sustained muscular effort and that an excess of a pale fiber is correlated with inability to respond to repeated stimulation. "The muscles in the heavy breeds of horse appear to be exclusively of a pale red variety. The Shire horse, even when thoroughly conditioned and fit, rapidly suffers from muscle asphyxiation if made to gallop at his top pace, poor as it is, for a short distance. . . . The physiological properties of the muscles of certain race horses are sharply defined from those of others. . . . The gametic composition of these individuals is in accordance with a Mendelian conception of alternative unit characters." "The graduated series of distances over which races are run in Great Britain and Ireland provides a test which, though perhaps not entirely free from error, is, nevertheless, a reliable standard by which an individual horse's racing stamina can be assessed."

Tables are presented to show that mares are at a disadvantage as race horses after 2 years of age.

A note on yellow dun horses and the relation of this color to chestnut, C. J. DAVIES (*Mendel Jour., 1912, No. 3, pp. 197, 198*).—Some evidence is presented which throws doubt on the recessiveness of chestnut and other colors. It is also pointed out that until some distinction is made between bay and brown it will be impossible to analyze results on the inheritance of color in horses.

The horse's foot, E. T. ROBBINS (*Breeder's Gaz., 62 (1912), No. 8, pp. 305, 306, figs. 4*).—A discussion of the essential points of the hoofs to be noted in buying horses, based on many years' experience of an expert buyer.

Laying test with different breeds of poultry, C. B. JONES (*Univ. Col. Wales, Agr. Dept. Bul. 1 [1912], pp. 17–19*).—An egg-laying test is reported which lasted from December 1, 1908, to March 18, 1909. The 10 Plymouth Rock hens laid 237 eggs, the 10 Buff Orpingtons 491, and the 9 Partridge Wyandottes 508.

Egg-laying competitions, D. S. THOMPSON (*Dept. Agr. N. S. Wales, Farmers' Bul. 57, 1912, pp. 14*).—A summary of 10 years' work at the Hawkesbury Agricultural College and Experiment Farm, Richmond, New South Wales. The average number of eggs laid per hen was 131 in the first year's contest and 184 in the last year. There was also a noticeable improvement in the type of bird.

Sex-limited inheritance in poultry, C. B. DAVENPORT (*Jour. Expt. Zool., 13 (1912), No. 1, pp. 1–18, pls. 8, fig. 1*).—A brief review of previous investigations, and a complete report of work previously noted (E. S. R., 26, p. 878) in support of the formula that sex-limited characters have their determiners in the sex chromosomes.

Reciprocal crosses were made with brown Leghorns and dark Brahmas. In the F_1 crosses all males were light, but the females differed according as the brown Leghorns or the dark Brahmas were used as the father. In the F_2 generation there were 2 kinds of males. The observations seem in accord with the hypothesis that the male carries 2 sex chromosomes and the female 1, and that the determiners for certain secondary sex characters are centered in the sex chromosomes, although the development of other characters seems to be especially influenced or modified by the secretions of the sex glands.

Study in ostrich breeding, J. L. FRATEUR (*Bul. Agr. Congo Belge, 2 (1911), Nos. 3, pp. 371–388; 4, pp. 678–692; 3 (1912), Nos. 2, pp. 366–390; 3, pp. 719–739, figs. 57; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 3, pp. 747–749*).—A statistical and general article on ostrich breeding in various countries. Methods of breeding and feeding are described.

DAIRY FARMING—DAIRYING.

Production and inspection of milk, E. V. WILCOX (*Hawaii Sta. [Spec. Pub.], 1912, July 31, pp. XI+348*).—In this publication the author has reviewed the literature on milk and has presented detailed information under the following chapter headings: Normal milk, abnormal milk, hygiene and diseases of cows, feeding cows, buildings and premises, milking and handling milk on the farm, transportation and sale of milk, refrigeration, pasteurization and sterilization of milk, preservatives in market milk, physical and chemical examination of milk, bacteriology of milk, transmission of infectious diseases of milk, milk products in their relation to health, and history of milk inspection. A chapter by Louise Tayler-Jones is given on the dietetics of milk with reference to infant feeding.

A bibliography of milk inspection is included.

Studies of dairy husbandry, with special reference to the capital invested, E. CAJANDER (*Abhandl. Agr. Wiss. Gesell. Finland, 1911, No. 2, pp. 76, tables 39*).—This study is based mainly on statistics gathered by the author from 124 dairy farms in Finland. The results are presented in tabular form.

There were more cattle kept per hectare on the small farms than on the large farms. More capital was invested in buildings than in cattle, except in the group of large farms. The largest amount of capital invested per hectare was found on the large farms, but the largest amount of capital per animal was on the small farm.

Cattle breeding in Vorarlberg, J. K. GREISENEGGER (*Ztschr. Landw. Versuchsw. Österr., 15 (1912), No. 8, pp. 901–1001*).—A discussion of the influence of age, weather, conformation, and other factors on milk secretion, based on the milk records and measurements of cows of the Montavon breed, which are presented in tabular form.

The Illawarra breed of dairy cattle, F. MCCAFFREY (*Amer. Breeders Mag., 3 (1912), No. 3, pp. 164–173, figs. 5*).—This contains an account of the origin and characteristics of this type of cattle, which has become a favorite for dairying in the Illawarra district, New South Wales. It has been developed by crossing Shorthorns, Longhorns, Devons, and Ayrshires.

Cooperative cow-testing associations in Minnesota, T. SEXAUER, C. S. CATHCART, and H. C. MCMURRAY (*Albert Lea [Minn.] State High School Ext. Bul. 1, 1912, pp. 55, figs. 12*).—This contains records of 28 herds, comprising 455 cows.

"The best herd produced an average of 9,485 lbs. of milk and 315 lbs. of butter fat per cow, valued at $99. The average cost of feed per cow was $41.69, making a net profit of $57.31 per cow. The poorest herd produced an average of 1,976 lbs. of milk and 90.7 lbs. of butter fat per cow, valued at $27.88. The average cost of feed per cow was $20.43, making a net profit of $7.45. The silage-fed herds (12 herds, 216 cows) produced an average of 5,706 lbs. of milk, 220 lbs. of butter fat, and made a net profit of $33.04 per cow. The herds that were not silage fed (16 herds, 239 cows) produced 3,850 lbs. of milk, 161 lbs. of butter fat, and a net profit of $22.98 per cow."

Feeding dairy cows, C. C. HAYDEN (*Ohio Sta. Circ. 128, pp. 183–211, fig. 1*).—This is a popular discussion of the feeding of dairy cows, in which are considered such factors as the composition of feeds, the feeds which can and should be grown on the farm, the feeds which may be purchased and their relative value, the physiological effect of the various feeds on the animal, and practical details of feeding. A table showing the amount of digestible nutrients in a large number of feeding stuffs, modified from Henry's Feeds and Feeding (E. S. R., 24, p. 769), is appended.

Cost of delivering a quart of milk to the consumer (*Hoard's Dairyman, 43 (1912), No. 25, p. 859*).—As estimated by a firm in Boston the cost of delivering a quart of milk to the consumer was 4.4 cts., to which must be added 0.37 ct. for shrinkage. The average price paid to the producer for 1 year was 3.9 cts. per quart, making a net cost per quart when delivered to the consumer of 8.67 cts.

The effect of sodium chlorid and cold storage upon the activities of proteolytic enzyms, W. N. BERG (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 19 (1912), Sect. VIIId, pp. 25–27*).—This is an abstract of a paper read before the International Congress of Applied Chemistry, September, 1912.

From the result of studies made with butter, buttermilk, and skim milk it is concluded that at low temperatures and in the presence of sodium chlorid the activity of a proteolytic enzym may be inhibited if the amount of enzym is small, whereas if the amount of enzym is large proteolysis takes place rapidly and is apparently not interfered with by the low temperature or the chlorid. The methods used are described.

Enzym content of milk from diseased udders, H. ULMANN (*Amer. Jour. Vet. Med., 7 (1912), No. 8, pp. 329, 330*).—Previously noted from another source (E. S. R., 27, p. 287).

The chemical changes taking place in milk under pathological conditions, L. W. FETZER (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 19 (1912), Sect. VIIId, pp. 111–114*).—This is an abstract of a paper read before the International Congress of Applied Chemistry, September, 1912. The principal changes which were found to take place in the milk of cows suffering from inflammation other than tuberculosis of the mammary glands were the following:

Most milks at the beginning of the process showed a diminution of the apparent acidity. This in some instances went on until alkalinity set in and remained until the disease began to undergo resolution. The acidity then gradually rose to its normal point again.

In acute cases the total solids were high at the outset, but as the process went on there was a diminution. In some instances there was an increase in total solids-not-fat, while in others no marked change took place. Total nitrogen and protein (N×6.38) increased at the outset and remained high until resolution took place. Casein diminished in some instances and remained so until the pathological condition was eliminated. Lactglobulin (?) (serum globulin) increased until resolution set in. Albumin (?) (serum albumin) increased during the whole process, then returned to normal.

Lactose diminished gradually as the process went on, then returned back to normal. Fat and cholesterol diminished gradually until the fastigium of the process was reached, then increased again. Lecithin diminished gradually, then increased gradually as resolution was taking place.

Ash in some cases increased, but only in a few instances was a very large increase apparent. The most characteristic changes taking place in the composition of the ash were an increase in the sodium and chlorin content, a corresponding decrease in the potassium content, and in most instances a decrease in the calcium and phosphoric acid content. In all probability a determination of the chlorin content of the milk, or specifically in the ash, will furnish a clue as to whether or not the milk in question is of pathological origin.

Investigations on the presence of tubercle bacilli in milk and milk products, A. EBER (*Ztschr. Fleisch u. Milchhyg., 22 (1912), Nos. 8, pp. 243–249; 9, pp. 277–281; Molk. Ztg. Berlin, 22 (1912), Nos. 36, pp. 423, 424; 37, pp. 434–436; Deut. Tierärztl. Wchnschr., 20 (1912), No. 30, pp. 457–461*).—Mixed

milk and butter therefrom were found to contain tubercle bacilli, which were rarely present in unmixed milk. None of the samples of butter made on a small farm contained tubercle bacilli, whereas they were found in 15.6 per cent of the samples of creamery butter. The author advocates pasteurizing all mixed milks, because if the tubercle bacilli are present in only one lot the entire mixture is contaminated.

A study of the bacteriological and sanitary condition of the milk supply of New York City, M. C. SCHROEDER (*Jour. Infect. Diseases, 11 (1912), No. 1, pp. 1–20, pls. 2, figs. 2*).—Of 20,334 samples of country milk 38.14 per cent contained less than 10,000 bacteria, 32.61 per cent contained from 10,000 to 50,000, 11.81 per cent contained from 50,000 to 100,000, 13.39 per cent from 100,000 to 1,000,000, and 4.02 per cent contained over 1,000,000 bacteria per cubic centimeter.

Samples of city milk showed a higher bacterial content, not to be accounted for by the factor of time. It is suggested that it may be due in part to the use of cans and bottles which are not clean and are poorly iced in transit. Milk sold in bottles had a lower bacterial count than that sold in cans.

Some of the conclusions based on this analysis are the following: "The pasteurization of milk by the holding process, though still leaving much to be desired, reduces greatly the number of bacteria, besides destroying any pathogenic varieties. Ice is not sufficiently used to cool the milk. The average temperatures of the milk as delivered to the creameries by the dairymen, with the exception of the winter months, is still too high for milk to be shipped to New York, and has an unfavorable influence upon the milk by aiding the growth of bacteria. Greater care should be observed to obtain clean milk by sterilizing the cans and bottles. The greater part of the milk sold is from 36 to 48 hours old, but a considerable portion is from 72 to 96 hours old, and some even more than 96 hours. This is true of both raw and pasteurized milk."

Creamery inspection, B. H. RAWL (*N. Y. Produce Rev. and Amer. Cream., 34 (1912), No. 18, pp. 784, 785; Cream. and Milk Plant Mo., 1 (1912), No. 1, pp. 16–19; Cream. Jour., 23 (1912), No. 14, pp. 1–4*).—This paper was read before the Association of National Dairy and Food Commissioners, 1912. It discusses state and federal inspection, the organization of inspection, standards for cream, and related matters.

Butter control, L. VUAFLART (*Ann. Falsif., 5 (1912), No. 46, pp. 379–384*).—In determining the chemical constants of butter made under different conditions, the author found that the composition of butter made from 1 or 2 milkings, or from mixed farm milk, varied to only a slight extent. That made from morning milk contained slightly more volatile acid than that from evening milk. Keeping cream 8 days did not affect the composition of the cream, neither did bichromate of potash when used as a preservative.

Butter making on the farm, A. B. NYSTROM (*Washington Sta. Popular Bul. 41, pp. 4*).—Brief popular directions are given.

The German cheese standards (*N. Y. Produce Rev. and Amer. Cream., 34 (1912), No. 10, pp. 492, 493*).—A translation of that portion of the report of the Unofficial Association of German Food Chemists which contains the definition of cream, half cream, and skim cheese.

Studies on the factors concerned in the ripening of Cheddar cheese, E. G. HASTINGS, ALICE C. EVANS, and E. B. HART (*Wisconsin Sta. Research Bul. 25, pp. 54, figs. 6*).—This bulletin presents a summary of the present knowledge of the bacteriology of Cheddar cheese and the results of a detailed study of a number of cheeses. See also a previous note (E. S. R., 23, pp. 383, 679).

Tests were made to illustrate the effect of curdling on the distribution of bacteria. In all samples examined in the laboratory it was noted that a unit

volume of the whey contained less bacteria than the milk before curdling, approximately 77 per cent of the bacteria being retained in the curd. These tests were repeated under cheese-room conditions with similar results.

Whey was found to increase in acidity much more rapidly in contact with the curd than when removed as soon as the curd was cut. In one sample the whey in contact with curd was found to be 0.23 per cent more acid at the end of 10 hours than whey removed when curd was cut. With deep beakers filled with milk, the milk curdled with rennet, the curd cut and allowed to settle, and the beakers so kept as to allow no convection currents it was found that the acidity of bottom layers of whey increased much faster than that of the upper layers, the difference being in some cases 0.4 per cent.

In a cheese made from milk containing but few acid-producing bacteria the ripening was so delayed that at the end of 3 months the cheese showed spongy texture and scarcely any cheese flavor. In an experiment to show the enzymic action of lactic bacteria by the difference in rate of increase in acidity between raw and heated milk preserved with 3 per cent toluol, the daily increase in acidity of the raw milk was found to vary from 0.0012 to 0.0027 per cent and of the heated milk from 0.0005 to 0.0017 per cent. Since results of inoculation of sterile milk have shown that no growth could have taken place after addition of toluol any increase in acidity of the heated milk must have been due to the enzyms set free by the disintegrating cells that act on the milk sugar during the ripening of cheese. Some cultures of *B. lactis acidi* produced inactive acid, some dextro-acid, and some mixtures of the two. One culture from another source produced pure levo-acid.

In studying the percentage of acidity produced by lactic bacilli in milk to which peptone had been added, it was shown that the cessation of their growth in milk when a certain percentage of acidity is reached is not brought about by the antiseptic action of the acid, but by a lack of suitable nitrogenous food.

The development of *B. lactis acidi* was followed by the growth of the *B. bulgaricus* group. They reach numbers comparable with those of the first group, reaching their maximum numbers within the first month of the ripening. Since they developed after the fermentation of the sugar, they must have some other source of carbon and of energy than milk sugar. Coccus, chromogenic, and liquefying types were found and other tests were made which confirmed the work of previous investigators.

A new use for whey (*Molk. Ztg. Berlin, 22 (1912), No. 35, pp. 409, 410*).—A note concerning a new beverage that can be made from whey, and which is called whey lemonade. The method of making is not described.

Tätté, the original preserved curd of the North, and other fermented milks; their significance for the nutrition of man, O. J. Olsen-Sopp (*Centbl. Bakt. [etc.], 2. Abt., 33 (1912), No. 1–6, pp. 1–54, pl. 1; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 6, pp. 1433–1435*).—Tätté is prepared from milk while still warm from the cow, by adding some of the old curd which has been dried on straw or linen cloths. The organisms present depend somewhat on the age of the preparation, but *Streptobacillus tätte, Lactobacillus tätte, and Saccharomyces tätte* were always found, and quite frequently species of Monilia, Torula, and Lactococcus. *Oïdium lactis* was common when the preparation was of poor quality.

"Cellar milk" is another form of fermented milk made in Sweden and Norway, and used by the inhabitants of the valleys when the cattle are kept in the mountains during the summer. It is prepared from fresh milk by adding water, boiling, and placing it in the cellar in large wooden vessels previously scalded with a juniper decoction and then rubbed with tätté. The vessels are covered with muslin and the milk after the first week is well mixed every

day. It has the characters of good sour milk and does not grow moldy or putrefy throughout the summer.

Officials, organizations, and educational institutions connected with the dairy interests, 1912 (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 204, pp. 26*).—This is a revision of Circular 162, previously noted (E. S. R., 23, p. 676).

VETERINARY MEDICINE.

Handbook of veterinary surgery and obstetrics, edited by J. BAYER and E. FRÖHNER (*Handbuch der Tierärztlichen Chirurgie und Geburtshilfe. Vienna and Leipsic, vols. 1, 1910, 4. ed., pp. XVI+745, figs. 562; 2, 1911, 4. ed., pp. XVI+340; 3, 1908, pt. 2, pp. VIII+442, figs. 78; 3, 1911, pt. 3, pp. VIII+298, pls. 5, figs. 77; 4, 1908, pt. 1, 2. ed., pp. XI+646, figs. 152; 4, 1908, pt. 2, pp. X+680, pls. 6, figs. 270; 5, 1906, 2. ed., pp. XIII+536, pls. 17, figs. 279; 6, 1908, 2. ed., pp. XV+572, pls. 8, figs. 95; 7, 1910, pt. 1, 3. ed., pp. XV+420, figs. 90*).—This work by various authors treats of the subject as follows: Volume 1, operative technique, by J. Bayer; volume 2, general surgery, by E. Fröhner; volume 3, parts 2 and 3, the head, neck, chest, and abdomen, by E. Hess et al.; volume 4, part 1, the extremities, by several authors and part 2, hoof diseases of the horse, by R. Eberlein; volume 5, diseases of the eye, by J. Bayer; volume 6, skin diseases, by H. Schindelka; and volume 7, bovine obstetrics, by M. G. de Bruin.

The diagnosis of pregnancy in animals by the optical and dialysis methods, E. ABDERHALDEN and A. WEIL (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 36, pp. 665–667*).—This is a continuation of the studies noted (E. S. R., 27, p. 577). The investigation, which was made with 12 cows, gave positive results in 10 cases. The dialysis method is easier to conduct, but the nature of the cleavage process can not be determined. The method of conducting the tests is given in detail.

The colloids in biology and medicine, H. BECHHOLD (*Die Kolloide in Biologie und Medizin. Dresden, 1912, pp. XII+444, pls. 2, figs. 52*).—The purpose of this book is to point out the colloid phenomena which occur in biology and medicine. It includes an introduction to the methods of colloid investigation, and a discussion of the biocolloids (carbohydrates, lipoids, proteins, foods and condiments, enzyms, and immunity reactions), the organism as a colloidal system (metabolism, the cell, blood, respiration, resorption and secretions, secretions and excretions, etc.), toxicology and pharmacology, and microscopical technique. A bibliography is appended.

The passage of drugs into the sweat, H. TACHAU (*Arch. Expt. Path. u. Pharmakol., 66 (1911), No. 5–6, pp. 334–346; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 592, II, pp. 184, 185*).—Iodin, bromin, boric acid, phenol, salicylic acid, salol, antipyrin, and methylene blue were found to be excreted in the sweat but the amount was small, as they pass into the milk and other secretions. The amount may be sufficient, however, to cause skin eruptions in certain cases.

The chemical examination of death camas, F. W. HEYL ET AL. (*Wyoming Sta. Bul. 94, pp. 3–31, figs. 3*).—The work here reported relates to *Zygadenus intermedius*, also known as poison camas, lobelia, squirrel food, wild onion, poison sego, poison sego-lily, mystery grass, etc. The alkaloid found in this plant is most abundant in the flowers, which contain approximately 1.25 per cent. The bulb and the leaves and tops contain approximately 0.6 per cent, and the roots but half that amount. Guinea pigs, dogs, and frogs were used in determining the physiological effect of the alkaloid and the antidotes.

The experiments led to the following conclusions: "The alkaloidal preparation from *Z. intermedius* slows the heart rate by acting apparently on the cardio-inhibitory center. It slows respiration by an effect involving the respiratory center. It causes vaso-dilation. In quantities approaching the fatal dose it hastens the heart rate and produces both irregularity of the heart beat and convulsive respiration. The fatal dose given intravenously to dogs stops the heart before respiration ceases. The fatal dose for guinea pigs is between 4.6 and 5.1 mg. per 100 gm. of animal. It has a very powerful action, whether injected or fed, both as a purgative and an emetic."

In order to ascertain the pharmacological properties of the resin present a series of experiments was conducted, the results of which demonstrated it to be physiologically inert.

The effect of Tilletia in the food of domestic animals, G. Pusch (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 11 (1912), No. 1, pp. 1–14*).—The investigations here reported have led the author to conclude that domestic animals may consume large quantities of wheat smut spores for a long period without ill effect; and that gestating ruminants and swine may consume large amounts of smutty wheat without aborting.

A mycotic enzootic caused by blighted barley, C. Darmagnac (*Abs. in Vet. Jour., 68 (1912), No. 445, pp. 434, 435*).—A brief report of forage poisoning in 21 horses caused by feeding on barley injured by smut (*Ustilago carbo*).

Destruction of bacteria by leucocytes, S. Suzuki (*Arch. Hyg., 75 (1912), No. 4–5, pp. 224–234*).—A systematic quantitative study of cytolytic activity of leucocytes toward various micro-organisms was made. It was noted that with the fairly sensitive micro-organisms, leucocytes in doses of 0.025 gm. are strongly bactericidal. In the case of the less sensitive micro-organisms, e. g., typhoid, cholera, and fowl cholera, the cytolytic activity ceases with the minimum doses, and even with quantities of 0.5 gm. this activity is very weak, and amounts of from 0.1 to 0.15 are necessary. Leucocytes in 0.025 gm. doses were more effective against the hog erysipelas bacterium than larger doses.

The development of a leucocytozoon of guinea pigs, E. H. Ross (*Ann. Trop. Med. and Par., 6 (1912), No. 1, pp. 69–76, pl. 1*).—"Kurloff's bodies are parasites, lymphocytozoa inhabiting only the mononuclear cells of the guinea pig's blood. These lymphocytozoa have an intracorpuscular stage, and ultimately give rise to free-swimming, spirochete-like bodies, which may be gametes. The development of the spirochete-like body is demonstrated. The name *Lymphocytozoon cobayæ* is suggested for this parasite."

The new mycoses, De Beurmann and Gougerot (*Les Nouvelles Mycoses. Paris, 1912, pp. 165, figs. 16*).—This work deals with the exascoses (ex-blastomycoses), oïdiomycoses, sporotrichoses, botrytimycosis, oösporoses, and hemisporosis.

Immunity facts and the outlook, H. Much (*Würzb. Abhandl. Gesam. Geb. Prakt. Med., 9 (1909), No. 6–7, pp. 117–184*).—This is a comprehensive digest of the facts relating to immunity. It deals particularly with the present knowledge of the subject as applied to both human and veterinary medicine.

In regard to opsonins, A. Frenzel (*Ueber Opsonine. Inaug. Diss., Univ. Leipsic, 1911, pp. 87*).—The Wright method for determining the opsonic index was found to be satisfactory and the percentage of errors was never greater than 10 per cent. The opsonic index of normal individuals, man and animals, was found to vary between 0.9 and 1.1. The indexes of infected individuals, which included tubercular humans and bovines, and humans with staphylococcic infections, were found to be in from 40 to 50 per cent of the cases within the normal figure, while all the rest had subnormal or hypernormal indexes. The behavior of blood sera of sound horses and other domesticated animals

toward *Streptococcus equi* was found to be the same as with the tubercle bacillus and the staphylococcus (between 0.9 and 1.1).

In the work it was also shown that very large doses of the staphylococcus vaccine (and likewise opsonogen) are harmless to the animal organism (guinea pigs, rabbits, and dogs). The local treatment which was instituted by Wright and Strubell against staphylomycoses without determining the opsonic index was very satisfactory.

Contribution to our knowledge of antiaggressin sera, F. NEUFELD and KANDIRA (*Arb. K. Gsndhtsamt., 40 (1912), No. 1, pp. 1–23*).—After reviewing the aggressin theory and pointing out some of its unexplained features, the authors sought to determine whether a hitherto unrecognized antibody plays a rôle in the activity of anthrax and erysipelas immune sera. For the tests, which were made in viro and in vitro, a highly immune erysipelas serum and *Bacillus erysipelatis* were employed.

The results showed that a specific bacteriotropic action was present in most of the cases, and this, according to the authors, explains the reason for the protective and curative properties of the serum. While phagocytosis is present in normal animals the phagocytic manifestations were found to occur somewhat sooner in pathologic animals. The reason for believing that an antiaggressin immunity exists is therefore remote.

The sero-diagnosis of echinococcus disease, W. PFEILER (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 11 (1912), Nos. 1, pp. 70–96; 2, pp. 153–169, 3–4, pp. 255–304*).—This is a monographic study of the value of the various biological reactions for diagnosing hydatid disease. A bibliography of 152 titles is appended.

Ascoli's reaction (thermoprecipitin) for diagnosing erysipelas, P. SILVA (*Clin. Vet. [Milan], Rass. Pol. Sanit. e Ig., 35 (1912), No. 4, pp. 145–149*).—A specific antigen can be prepared from fresh or putrefied organs from animals affected with erysipelas. This antigen when tested with a specific serum will give a characteristic Ascoli reaction. In these tests no reaction was obtained with the serum from healthy hogs or hogs affected with infectious pneumoenteritis.

A case of swine erysipelas in man, LINSER (*Dermatol. Ztschr., 18 (1911), No. 4, pp. 352–354, fig. 1*).—The author reports a case of this disease in a butcher who injured his left hand while slaughtering a diseased hog. The injection of 25 cc. of swine erysipelas serum (Susserin) resulted in a cure in 3 days.

Enteritis, associated with infection of the intestinal wall by cyst-forming protozoa (neosporidia), occurring in certain native animals (wallaby, kangaroo, and wombat), J. A. GILRUTH and L. B. BULL (*Proc. Roy. Soc Victoria, n. ser., 24 (1912), No. 2, pp. 432–450, pls. 10*).—In this paper what appear to be 4 varieties of pathogenic neosporidia are described as seen in intestinal affections of 3 different genera of native animals, namely. *Sarcocystis macropodis* in the wallaby; *Ileocystis macropodis* and *Lymphocystis macropodis* in the kangaroo; and *Ileocystis wombati* in the wombat.

Theory and technique of the Wassermann reaction for detecting glanders, W. W. FEDDERS (*Viestnik Obshch. Vet., 1901, Nos. 8, 9, 10, 11; abs. in Centbl. Bakt. [etc.], 1. Abt., Ref., 49 (1911), No. 6, pp. 175, 176*).—This is a theoretical discussion in regard to the mechanism of the complement fixation reaction (E. S. R., 25, p. 181), and gives practical directions for conducting it. The specificity of the reaction is disturbed if the animal has been previously injected with mallein.

Increased toleration to mallein, K. DROGASHEVSKIĬ (*Arch. Vet. Nauk. [St. Petersb.], 41 (1912), No. 2, pp. 181–187; abs. in Berlin. Tierärztl. Wchnschr., 28 (1912), No. 30, p. 549*).—As a result of treating 200 horses with mallein the

conclusions reached are as follows: (1) Repeated injections of mallein accustom the horses to mallein. A weak reaction or none is obtained when the test is repeated. (2) The results obtained with repeated injections can not serve as a diagnostic aid unless a sufficient length of time elapses between each injection. (3) Malleinization, with the doses usually employed and in periods of 1 month apart, will not show any curative properties for glanders.

Malta fever in Arizona, with a preliminary report of cases, C. E. YOUNT and R. N. LOONEY (*South. Cal. Practitioner, 27 (1912), No. 6, pp. 257–261*).—The authors report 5 cases of Malta fever in man, thus indicating the occurrence of this disease among goats in Arizona.

Spontaneous nephritis in wild rats, W. OPHÜLS and G. W. MCCOY (*Jour. Med. Research, 26 (1912), No. 2, pp. 249–255, pl. 1*).—"Wild rats very frequently (at least in 2 per cent of all cases examined) suffer from a peculiar type of chronic nephritis, one of the characteristic features of which is a very marked tendency to epithelial proliferation and to cyst formation. A condition very similar in all respects to this spontaneous disease may be produced experimentally in white rats by subcutaneous injection of uranium nitrate."

Rabies and its control in New York State, J. G. WILLS (*N. Y. Dept. Agr. Bul. 29, 1911, pp. 307–330*).—A general account.

On sporotrichosis, L. DE BEURMANN, trans. by R. W. MACKENNA (*Brit. Med. Jour., 1912, No. 2693, pp. 289–296*).—A general discussion of this disease, the existence and importance of which have been demonstrated.

A contribution to the study of canine piroplasmosis, N. N. NAVROTSKY and P. V. BÉKENSKY (*Arch. Sci. Biol. [St. Petersb.], 17 (1912), No. 1, pp. 31–60, figs. 6; abs. in Amer. Vet. Rev., 41 (1912), No. 6, pp. 639–642*).—This paper takes up the clinical appearance of the disease, the condition of the blood and of the urine, the anatomo-pathologic lesions, and the virus.

Trypanosomes obtained by feeding wild Glossina morsitans on monkeys in the Luangwa Valley, northern Rhodesia, A. KINGHORN and W. YORKE (*Ann. Trop. Med. and Par., 6 (1912), No. 3, pp. 317–324, fig. 1*).—The trypanosomes *Trypanosoma rhodesiense*, *T. pecorum*, *T. ignotum*, and probably also *T. vivax* and *T. nanum*, are transmitted in nature by *G. morsitans* in the Luangwa Valley.

[The occurrence of dourine ("Mofo") in Ceará, Brazil], M. SABOIA (*Sobre a Trypanosomiase dos Équidas, Conhecida no Ceará pelo Nome de "Mofo." Rio Janeiro, 1912, pp. 64, pls. 8*).—The author has succeeded in isolating a trypanosome from sick horses which is apparently *Trypanosoma equiperdum*, the causative agent of dourine. The disease, known in Brazil as "Mofo," has existed as an epizootic for several years in certain districts of that country; the syndrome resembles dourine in every particular.

A note on the morphology of a strain of Trypanosoma equiperdum, W. YORKE and B. BLACKLOCK (*Brit. Med. Jour., 1912, No. 2696, p. 473, figs. 14*).—This note relates to stumpy forms of this parasite which have the macronucleus displaced toward the posterior end.

Note on surra, E. W. OLIVER (*Dept. Land Records and Agr. United Prov. Agra and Oudh, Agr. Ser., 1912, Bul. 27, pp. 4, pl. 1*).—A brief general account with directions for prevention and treatment.

Relation between human and bovine tubercle bacilli, G. S. WOODHEAD (*Lancet [London], 1912, I, No. 22, pp. 1451–1457; abs. in Jour. Amer. Med. Assoc., 59 (1912), No. 1, p. 70*).—Bovine tubercle bacilli are not considered a negligible quantity as far as tuberculosis in man is concerned. Surgical and abdominal tuberculosis in man will, according to the author's belief, be found to have a direct relation to bovine tuberculosis.

The relative importance of the bovine and human types of tubercle bacilli in the different forms of tuberculosis, W. H. PARK and C. KRUMWIEDE (*Jour. Med. Research, 27 (1912), No. 1, pp. 109–114*).—This is a final summary of the cases investigated by these authors (E. S. R., 22, p. 390), and which shows that on the whole bovine infections cause somewhat less than 10 per cent of the total deaths in young children.

Passage tests with human tuberculous material according to Eber's method, F. NEUFELD, H. DOLD, and E. A. LINDEMANN (*Centbl. Bakt. [etc.], 1. Abt., Orig., 65 (1912), No. 6–7, pp. 467–481*).—As a result of several passage experiments the conclusion is reached that human tubercle bacilli can not be converted into the bovine type by Eber's method (E. S. R., 26, p. 680).

The use of the Millon reagent for the examination of tuberculous excretions, B. NICOLA (*Riv. Ig. e Sanit. Pub., 22 (1911), No. 10, pp. 296–304; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 5 (1912), No. 11, p. 1115; Chem. Abs., 6 (1912), No. 18, p. 2642*).—It is concluded that Millon's reagent will give useful results for the examination of tuberculous pus, but can not be used for differentiating tuberculous from nontuberculous pus. It is not serviceable for the first stages of the disease.

Complement-fixing antibodies and tuberculosis, B. MOLLERS (*Centbl. Bakt. [etc.], 1. Abt., Ref., 54 (1912), Beiheft, pp. 202–212*).—The injection of tuberculin in large doses or of killed tubercle bacilli causes the formation of complement-fixing antibodies. The greatest amount of antibodies are produced with the dead bacilli when injected intravenously. The results obtained by the complement-fixing method can not at the present time be entirely relied upon for prognostic or diagnostic purposes.

A phosphatid as an activator for tuberculin, H. J. BING and V. ELLERMANN (*K. Danske Vidensk. Selsk. Forhandl., 1912, No. 2, pp. 153–167; Biochem. Ztschr., 42 (1912), No. 4, pp. 289–301; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 6 (1912), No. 1, p. 399*).—A diamino phosphatid albin, was prepared from egg yolks and has the property of stimulating the cutaneous reaction obtained with tuberculin. None of the other lipoids (lecithin, kephalin, cholesterol, oleic acid, sodium oleate, etc.) has the same properties. The activation of tuberculin is possibly of significance as to the action of tuberculin upon the tubercular organism.

Tuberculosis, M. A. MÉTIN (*Rev. Vét. [Toulouse], 37 (1912), No. 10, pp. 615–623*).—This is a discussion of the budget granted in France for combating tuberculosis in 1913, together with indemnities for condemned animals suffering from tuberculosis, glanders, and pneumonia. Mention is made of the decrease of contagious diseases and of the methods prescribed for combating them.

About a case of tuberculosis in a horse, W. GREYER (*Deut. Tierärztl. Wchnschr., 20 (1912), No. 43, pp. 657–659, fig. 1*).—A description of the autopsical findings with a horse affected with generalized tuberculosis.

Tuberculosis in dairy cattle, E. M. RANCK (*Mississippi Sta. Circ., 1912, Aug., pp. 35, figs. 13*).—This is a reprint of a report previously noted (E. S. R., 26, p. 378), with brief suggestions as to the inspection of dairies.

Notes on infectious abortion in cattle, F. M. SURFACE (*Science, n. ser., 36 (1912), No. 926, pp. 409–412*).—This is a brief résumé of investigations conducted in the United States and Europe in regard to infectious abortion in cattle. The biological reactions for detecting the disease and the factors which are instrumental in disseminating it are discussed.

Investigation in regard to the biology of the Bacillus abortus and infectious abortion in bovines, H. HOLTH (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 10 (1911), No. 4, pp. 207–273, fig. 4; abs. in Hyg. Rundschau, 22*

(1912), No. 11, p. 717).—This is a critical study of the morphology and biology of *Bacillus abortus*, the patho-anatomical changes which are present in aborting bovines, the avenues of infection, and the occurrence of anti-substances in the blood of spontaneously and artificially infected animals, with particular reference to active and passive immunity.

It is shown that the production of agglutinins and amboceptors in artificially infected animals is variable, and that much depends upon the method of introducing the vaccine and whether dead or living organisms are employed. Experimental data are also presented in regard to the behavior of chemical and thermal agencies against the immunizing and anti-substances. In addition some immunizing and protective tests with rats and mice are reported, which show that spotted rats acquire a decided immunity against this organism when treated with killed cultures or culture filtrates of *Bacillus abortus*.

Therapeutic tests with curative lymph (Gans) and colpitol (Gans) for contagious vaginal catarrh in bovines, A. GÖHLER (*Centbl. Bakt. [etc.], 1. Abt., Orig., 65 (1912), No. 6–7, pp. 515–538*).—Gans' curative lymph was found to have only a slight curative power for this disease. Colpitol, on the other hand, affected cures in 30 per cent of the cases, and in all instances where employed improvement was noted in from 16 to 18 days.

Check list of helminths parasitic in cattle, R. T. LEIPER (*Jour. London School Trop. Med., 1 (1912), No. 2, pp. 115–123*).—A systematic list of the helminth parasites of *Bos taurus*, *Buffelus indicus*, and *Bibos indicus* is followed by an alphabetical list of helminths in cattle and a second list of new genera and species of helminths recorded in 1911.

The introduction of air into the jugular vein, F. CHAMBERS (*Vet. Jour., 68 (1912), No. 445, pp. 415, 416*).—The author reports experiments made to determine the minimum quantity of air which will kill a bovine when injected into the jugular vein. In the first case, a heifer 3 years old, it took 2,346 cc. of air administered in 12 minutes to cause death; in the second case, that of a 2-year old ox, it took 2,500 cc. of air injected in a period of 4½ minutes to cause death; in the third case, that of 5-year-old cow, 3,000 cc. of air administered quickly caused the death of the animal in 1 minute.

Successful vaccination against pluriform septicemia in sheep, ANDERS (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 38, pp. 701, 702*).—In certain districts in Germany quite a number of deaths in lambs occurred as a result of pluriform septicemia. Vaccinations were made with Miessner and Schern's serum in 1908, 1911, and 1912, and these reduced the mortality considerably. Out of 700 4-week-old sheep, which were vaccinated intravenously in 1912, only 10 died.

Antisheep pox vaccination with heated virus, E. DUCLOUX (*Compt. Rend. Soc. Biol. [Paris], 72 (1912), No. 16, pp. 709, 710; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 6 (1912), No. 1, pp. 380, 381*).—Continuing the work previously noted (E. S. R., 27, p. 583) results are now reported which were obtained with 650 sheep. Of these animals 590 were treated with 0.5 cc. of heated virus, followed 7 days later by an injection of virulent virus, and the remaining 60 animals kept as controls.

Of the treated animals 582 showed no reaction toward the injection, 7 showed a slight growth at the site of injection, and 1 had a slight edema. Of the control animals 56 were markedly affected with the pox.

The method of preparing the vaccine has been slightly modified.

Congenital bronchial strongylosis in sheep, NEVEU-LEMAIRE (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 20, pp. 1311, 1312*).—The author records observations of the occurrence of adults of *Dictyocaulus filaria* in 2 young lambs in which the infestation must have taken place prior to birth.

"Mal de Lure:" A pyemia secondary to contagious agalactia of the sheep and goat, H. CARRÉ (*Ann. Inst. Pasteur, 26 (1912), No. 4, pp. 281–299, pl. 1, figs. 2*).—The author has found "mal de Lure," which develops secondary to contagious agalactia in sheep and goats, to be due to a new pyogenic bacillus, to which he has given the name "pyobacillus of the sheep and goat." This affection was prevalent during 1911 in the Lure mountain district of southeastern France. The disease is manifested by a purulent sloughing condition of the eyes and udder, suppurative arthritis of the knees, stifles, and hips, and a progressive muscular wasting.

Hog cholera, E. L. MOORE and T. B. KELLY (*South Dakota Sta. Bul. 138, pp. 370–391, figs. 5*).—This bulletin consists largely of a general account of hog cholera, including post-mortem appearances, prevention by artificial immunity, the method of producing and testing potent serum, method of vaccination, sanitary measures, etc.

The results of investigations indicate that there is no constant relation between the agglutination reaction of immunizing serum for *Bacillus cholerœ suis* and its potency as shown by actual field trials. Thus it can not be used as a method of standardizing serums for commercial purposes.

Investigations made to determine the value of the salt solution recovered from the intraperitoneal cavity of hogs killed with acute cholera for hyperimmunization purposes are briefly reported and considered very satisfactory, the virulence of the recovered salt solution having met the standard requirements. The authors state they can see no reason why it can not be used successfully in hyperimmunization work.

New sero-therapeutic tests for hog cholera, P. STAZZI (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 38, pp. 697–701*).—After giving the geographical distribution of the disease in the districts around Pavia and Milan, Italy, and the preparation of hog-cholera serums, the results of a comparative investigation of the protective value of Hutyra's and L. W. Gans' serums, and the serums prepared at the experiment station for infectious diseases of domesticated animals of the Agricultural Association of Milan, are reported.

In the first series of tests 38 shotes, 3 months old, weighing from 20 to 22 kg., were treated as follows: Ten received the Milan serum, 20 Gans' serum, and 8 animals were injected with Hutyra's serum. All of the animals mentioned above and 6 control animals received injections after the second day of 2 cc. of blood obtained from strongly infected animals. Four of the 6 control animals died within 15 to 20 days, and the other 2 went through the course of a light form of the disease. Of the animals treated with the Milan serum and the Gans serum 1 succumbed in each case, while with Hutyra's serum none of the animals became sick. A second set of experiments conducted under the same conditions gave less favorable results.

In a second series of tests in which an attempt was made to simulate practical conditions animals having natural hog cholera, and others artificially infected, were used. These animals with some controls were housed in the station barns. Far better results were obtained from these tests than from the first series. All of the control animals died of an acute hog cholera, while out of 21 treated animals only 1 died.

It is pointed out that the serum confers marked immunity, which, however, may not be absolute. The curative action of Gans' new serum was found to be very slight or nil.

Immunizing against swine plague, ROELCKE (*Arch Wiss. u. Prakt. Tierheilk., 37 (1911), No. 4, pp. 367–381; abs. in Berlin. Tierärztl. Wchnschr., 28 (1912), No. 6, p. 105*).—By treating experimental animals with carbolized cultures of the swine-plague bacillus an increased resistance toward experimental

infection can be obtained, but not an absolute protection since carbolic acid itself has some effect upon the antigen.

The possibility of utilizing glycerol cultures as a vaccine against swine plague was proved. Precaution, however, must be taken that the glycerol and culture are present in the ratio of 1:1. An excess of glycerol must be avoided.

Investigations in regard to the agglutination of paratyphoid and pestifer strains, Teodorascu (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 14 (1912), No. 6, pp. 639–646; abs. in Centbl. Bakt. [etc.], 1. Abt., Ref., 54 (1912), Beiheft, pp. 83, 84*).—A number of strains of the organisms belonging to the paratyphoid group were isolated from man and pig, and compared as regards their agglutinating properties with paratyphoid, suipestifer, Voldagsen, and Glässer serums. The results agree well with those obtained previously by Haendel and Gildemeister (E. S. R., 26, p. 785).

The effect of wheat eating by horses, W. T. Kendall (*Aust. Farm and Home, 21 (1912), No. 8, pp. 346, 348*).—The author, having conducted a series of feeding experiments on horses, here gives a brief account of the symptoms, causes of death, and treatment.

A contribution to the study of infectious epididymo-vaginalitis of the horse, C. Medynski (*Bul. Soc. Cent. Méd. Vét., 89 (1912), No. 4, pp. 99–106*).—The author reports clinical and laboratory studies made of this disease, first recognized and studied in Havre by Vallée, Lesueur, and Lavergne in 1905[a] and by Guido Finzi in 1910 (E. S. R., 24, p. 485). He finds that the serum from sick or convalescing animals agglutinates Vallée's bacillus in a dilution of 1:200 whereas at the onset of the disease agglutination took place only at a dilution of 1:10. The injection of diseased animals daily for a period of 5 days with 100 cc. of serum obtained from a convalescing animal resulted in rapid improvement.

Certain concretions in a cyst of the mammary gland in a horse, A. Scheunert and W. Grimmer (*Hoppe-Seyler's Ztschr. Physiol. Chem., 76 (1912), No. 4, pp. 322–329; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 592, II, p. 186*).—The concretions examined gave the following percentages: Water 69.0, protein 4.5, fat 13.7, cholesterol 10.0, lecithin 0.7, and ash 1.7. The fat somewhat resembled colostral fat, being intermediate between milk fat and the body fat of the horse. Casein was absent.

Check list of helminths parasitic in equines, R. T. Leiper (*Jour. London School Trop. Med., 1 (1912), No. 1, pp. 22–26*).—Systematic and alphabetical lists are given. See also a previous note (E. S. R., 27, p. 583).

Report of the bacteriological institute of the agricultural chamber of Rheinisch Prussia (*Jahresber. Landw. Kammer Rheinprovinz, 1911, pp. 70–76*).—This is a report in regard to the activities of this institution for the year 1911. It deals with the results of combating tuberculosis in animals; tests in regard to combating various infectious diseases, such as vaginal catarrh; determination of the cause of death in animals; and destruction of mice, rats, etc., with mouse typhoid cultures.

RURAL ENGINEERING.

Cooperation in water power and irrigation, J. H. Lewis (*Pacific Builder and Engin., 14 (1912), No. 12, pp. 246–248*).—This is a paper presented before the Development League Conference, at Lakeview, Oreg., in August, 1912, dealing with the exercise of state credit in developing arid lands and water powers.

It is claimed that most of the large commercial enterprises undertaken by

[a] Bul. Soc. Cent. Méd. Vét., 82 (1905), No. 14, pp. 333, 334.

private capital and nearly all the state projects under the Carey Act have failed because of the lack of adequate engineering and complete financial plans, and because of inexperience on the part of the State and interested parties in obtaining good work. It is suggested that since the future prosperity of the State depends in a large measure upon the construction of the large irrigation works, the State should cooperate with the United States Reclamation Service and authorize a bond issue for the construction of irrigation and power projects—the money when invested to be made a lien upon the land irrigated and works constructed to insure its return in from 20 to 40 years with interest, thereby securing development without increasing taxation.

It is concluded that by this method much water power can be developed auxiliary to construction, thus reducing the burden on the irrigator, and that by cooperating with the United States Reclamation Service the state funds can be invested without running the risk of failure because of an inexperienced state department.

Triennial irrigation revenue report of Sind for the triennium ending 1910–11 (*Trien. Irrig. Rev. Rpt. Sind, 1908–9—1910–11, pp. V+84+2+2, pls. 7*).—This is the fourth triennial revenue report on irrigation works in Sind, containing statistical information, statements showing the working details and results attained on each project in 4 successive triennial periods, and brief general remarks.

[Modern irrigation methods] (*Nat. Land and Irrig. Jour., 6 (1912), No. 1, pp. 14–16, figs. 4*).—This article deals with past and present irrigation methods, presenting as conclusions that earth ditches are wasteful, costly, and shiftless; that wooden flumes are expensive, temporary, and wasteful; that concrete flumes are perishable, obstructive, and wasteful; and that a concrete pipe underground is a perfect water distributor, cheap in installation, durable, cheap in maintenance, standing very high internal pressures when reinforced, and if skillfully made with suitable materials considerable pressure without reinforcement.

Application of hydro-electric energy to irrigation pumping in southern Idaho, E. A. Wilcox (*Elect. World, 60 (1912), No. 14, pp. 705–710, figs. 13*).—This is a description of various installations with data on water requirements and considerations governing rates for service.

It has been found much cheaper and better to water a large tract of land with one large pumping plant than with a number of smaller ones, since the machinery efficiency is greater, the seepage and evaporation losses are reduced, and the cost of installation is lowered. The older data on water requirements called for a depth of 4 ft. or more annually, but recent tests show that a fraction of this is sufficient for most crops and soils. The demand for water runs over 6 months, from April to September inclusive; more than half of the total requirements falling in June and July and the load factor for the 6 months' season being about 0.5.

The energy required for pumping is directly proportional to the lift and to the quantity of water lifted. The cost of energy is based on the consumer's highest half hour peak as shown by a recording meter, the price being commonly $20 per horsepower of this peak for the 6 months' season. The generating equipment is used in winter for supplying heat for homes, offices, stores, etc., the heating load being taken on at a flat rate varying with the size and character of the installation.

Experiments of 1908–1910 on lining of water courses to reduce absorption losses, F. W. Schönemann (*Punjab Irrig. Branch Papers, 1912, No. 11–c, pp. 70, pls. 11*).—A large amount of absorption and evaporation data showing the efficiencies of different linings is presented.

Costs of mortar lining on irrigation canals, H. D. NEWELL (*Engin. News, 68 (1912), No. 15, pp. 651–653, fig. 1*).—This article gives cost data on the lining of irrigation canals in the Umatilla project of the United States Reclamation Service, including engineering, equipment, materials, and labor.

Canal M, 12,409 ft. long having a bottom width of 4 ft., depth 4 ft., and side slopes 1¼:1, was lined with 1:4 cement mortar 1½ in. thick, with a top curb 4 in. wide and 3 in. thick, at a total cost of $13,069.91 or 55½ cts per square yard. Canals L, T, and A, with side slopes of 1¼:1 and varying from a bottom width of 4 ft. and depth of 3½ ft. to a bottom width of 1 ft. and depth of 1½ ft. were lined where lining was most needed with 1:4 cement mortar, 1½ in. thick, at respective costs of $1,635.62 or 48.9 cts. per square yard, $4,633.70 or 62½ cts. per square yard, and $2,026.76 or 64.2 cts. per square yard. A series of gagings indicates that the lining placed has practically eliminated seepage losses.

Reclaiming Minnesota swamp lands, G. A. RALPH (*Farm Implements, 26 (1912), No. 8, pp. 36, 40*).—A summary of 6 years' drainage work in Minnesota, showing the reclamation of 6,250,000 acres of swamp land at a total cost of $10,008,608 and an estimated benefit of $18,778,915.

Filling a swamp with a pump, C. H. CLARK (*Amer. Cult., 74 (1912), No. 37, p. 2, figs. 4*).—A new method of swamp land reclamation, in which a dike was constructed inclosing the flat swampy end of a lake and electrically driven centrifugal pumps were used to pump out the surplus water and to wash the soil from the surrounding hills for filling in the swamp, is described.

The char-pit method of destroying stumps, H. W. SPARKS (*Washington Sta. Popular Bul. 40, pp. 8, figs. 5*).—A summary of data previously noted (E. S. R., 26, p. 787).

New state road law in Arizona (*Good Roads, n. ser., 4 (1912), No. 14, pp. 144–146*).—A new set of road laws regulating road administration, financing, construction, and maintenance in Arizona.

Benefits of improved roads (*U. S. Dept. Agr., Farmers' Bul. 505, pp. 20, figs. 8*).—This publication deals with the economic and social benefits of improved roads, quoting considerable statistical road data and cites examples to show that roads improved by surfacing and reducing the grade and length decrease the cost of hauling, increase the value of farm lands, increase the tourist travel, and improve school and social conditions, and the rural delivery mail service. It discusses the relation of roads to agricultural conditions and states that good roads mean the encouragement of diversified farming, an increase in the area of profitable production, more favorable marketing, and the securing of more uniform distribution of farm products.

In the discussion of hauling cost it is pointed out that the maximum grade of a road tends to limit the load that can pass over the entire road and that steep grades are more detrimental on improved than on unimproved roads, since the grade effect quickly exceeds that of the reduced tractive resistance. Attention is called to the almost total lack of reliable traffic data, and the advisability is suggested of making a traffic census, including total hauling charges, in each locality in order to obtain a ton-mile cost for the various commodities hauled, and therewith compute the amounts of money which may be profitably borrowed for road improvement.

Concrete highways in New York State (*Concrete-Cement Age, 1 (1912), No. 3, pp. 31–51, figs. 5*).—This article includes the principal construction specifications and tabulated data showing the details of concrete road construction, and makes particular reference to a jointless concrete road on Grand Island.

[Specifications for experimental jointless roads] (*Concrete-Cement Age, 1 (1912), No. 3, pp. 52–54*).—Specifications as issued by the Office of Public

Roads of this Department for cement concrete with bituminous surface, oil cement concrete, cement, gravel, crushed limestone, and crushed trap rock for road construction are presented.

A highway bridge in detail (*Cement Era, 10 (1912), No. 10, pp. 30, 31, figs. 2*).—Working plans and specifications are given of a novel combination of steel and reinforced concrete in a double span highway structure with reinforced concrete abutments and piers, and reinforced concrete floor supported on steel I-beam girders. The estimate shows 36,491 lbs. of steel and reinforcing and 267½ cubic yards of concrete for the 56 ft. structure.

Influence of moisture on the expansion and contraction of concrete (*Engin. Rec., 66 (1912), No. 14, pp. 375, 376*).—This is an abstract of a paper read by L. W. Page before the Ohio Engineering Society in which he gives the results and conclusions of investigations of the cracking of concrete, especially in road construction soon after completion, due to the inherent contractive qualities of the concrete mass in hardening.

The results show that the contraction and expansion vary with the strength of the mixture, which is a cause for shearing action and separation of the rich top coat from the leaner base mixture in concrete pavements. They further show that if during a period of 6 months the temperature of a concrete mass falls 100° F., each inch of length will contract 0.00055 in.; that if the mass dries, each inch will contract 0.00068 in.; and that there is a further contraction due to the subsequent loss of heat brought about by the chemical action of the cement. In a 100 ft. concrete roadway the contraction might be as much as 1½ in., which brings about an enormous tensile stress causing cracking and breaking up of the pavement.

[A selection of farm power], Strecker (*Maschinen Ztg., 10 (1912), No. 16, pp. 185–192, figs. 4*).—This is a discussion of the farm power question, making comparisons of the costs of power by electricity, internal combustion engines, and steam. Tables showing cost data are given for all three, with a table of comparative cost data, showing that economy in farm power depends on the use to which it is put, the amount required, the length of time it is to be used, and the local prices per unit of power. When from 8 to 20 horsepower are required for an average of 200 working hours or less per year, electricity is considered the cheapest, but when from 8 to 20 horsepower are required for from 600 to 1,500 working hours or more per year the data indicate that internal combustion power is the cheapest with steam and electricity alternating for second place in cheapness.

Electricity on the farm, P. A. Bates (*New York, 1912, pp. 1661–1679, pls. 12, figs. 3*).—This is a paper presented at the twenty-ninth convention of the American Institute of Electrical Engineers in which the author discusses the application of electricity to irrigation and drainage pumping and to farm lighting and machinery driving, describing several installations and pointing out their economic advantages. He discusses public service electric lines and farm cooperative systems, and states that where neither of these is feasible a small private system of lighting may be installed for approximately $250, and that more power as needed may be generated at reasonable cost. He encourages the use of electricity for lighting, heating, and power because of the great safety from fire.

Electricity in agriculture, A. Vietze (*Arb. Landw. Kammer Prov. Sachsen, 1911, No. 22, pp. 42, figs. 18*).—This pamphlet discusses the farm electric power and light movement with special reference to installation and relative economy of cooperative and central electric farm plants and public service systems, makes comparisons with other sources of power and light, and outlines the

technical and practical details of the use of electricity for farm lighting and for driving the different kinds of farm machinery.

Competitive tests of drills, G. FISCHER (*Arb. Deut. Landw. Gesell., 1912, No. 222, pp. 25, pl. 1, figs. 10*).—The methods and results of tests of 11 drills having working breadths of from 2 to 4 meters, wheel diameters ranging from 1 to 1½ meters, weights ranging from 400 to 1,200 kg., and prices ranging between 400 and 1,500 marks are described. The drills were tested with oats, peas, beans, wheat, rape seed, corn, and various mixtures of these in single and multiple row work under varying ground conditions, especially noting the influence of ground slope on the working of the machines and the distribution of the grain in the rows.

The results show that with one or two exceptions the drills did fairly good work in distributing the seed, and that the percentage of injured seed was small, although there is still room for improvement. The change in ground surface affected the machines materially, some of them giving very unsatisfactory results on hilly or sloping ground. The principal objections were to the general construction and prices of the machines.

Test of a mowing machine, J. REZEK (*Mitt. Landw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien, 1 (1912), No. 2, pp. 245–250, pl. 1, figs. 3*).—This is an ordinary mowing machine, set on 2 wheels, in which the axle transmits the motion by a ratchet to a set of 4 properly geared cogwheels, one of which is connected to a shaft. The shaft transmits the motion to a wheel and a wooden connecting rod which works the knives back and forth in the sickle. The cogs are thrown in and out of gear by means of a foot lever and the sickle elevation is regulated by a hand lever.

The machine was tested in heavy clover and in green corn in both wet and dry weather and under varying conditions of temperature and ground surface and was found to be a light running, good working, and durable mowing machine. A plan and elevation drawing of the machine accompany this report.

An investigation of the air lift pump, G. J. DAVIS and C. R. WEIDNER (*Bul. Univ. Wis., 1911, No. 450, pp. 167, figs. 40*).—This bulletin deals with the air lift pump in general, discussing the principles and theory of its operation, as set forth by leading authorities, together with a general description of several types of air lift pumping plants, consisting essentially of an eduction pipe, air compressor, air receiver, air line, foot piece, and tail piece. The disadvantages of the air lift pump are set forth as low efficiency, averaging from 25 to 33 per cent; great depth of submergence necessary for ordinary lifts; limited horizontal pumping capacity; and aeration, causing rusting of parts. The advantages are set forth as large capacity; low maintenance and operating costs; indifference to high temperatures; aeration, causing oxidation of impurities; and reliability. A large amount of data are given resulting from a number of experiments conducted on several different types of this pump showing that the variables which may affect a particular type and size of pump are the percentage of submergence, lift, discharge, volume, and pressure of air.

Farm buildings for landowners, agents, and tenants, C. E. CURTIS (*London, 1912, pp. VIII+144, pl. 1, figs. 22*).—This work deals with the arrangement, design, and construction of farm buildings in a manner simple enough to be intelligible and useful to landowners and their agents and tenants. It contains chapters on farm buildings, farm homesteads, buildings and their arrangement, plans, sections, and elevations, cow stables and covered yards, preservation of rain water, and buildings for small holdings.

A colony poultry house (*Ann. Rpt. Agr. Socs. Ontario, 12 (1912), pp. 76–78, figs. 3*).—A description is given of a portable colony poultry house 12 ft. long and 8 ft. deep set on 4 by 6 in. runners with a frame of 2 by 4 in. scantling,

and with walls, floor, and roof of matched pine flooring. The roof is covered with prepared roofing and the interior fixtures, such as doors, windows, roosts, nests, etc., are arranged to facilitate lighting, ventilating, and cleaning.

A concrete root cellar, D. FOLSOM (*Country Gent., 77 (1912), No. 39, p. 18, figs. 2*).—An outline is given as to the construction of a concrete root cellar, stating that it is essential that the site be well drained and dry under normal conditions to prevent dampness and decay inside. A 1:2:4 mixture is used for the footings, walls, and roof, and a 1:2½:5 mixture for the floor. The roof is reinforced with heavy woven wire fencing, and 2 drain tiles covered with galvanized iron hoods are used as ventilators. A side section of the building is given showing details.

[Hot water in a greenhouse], H. L. ALT (*Dom. Engin., 60 (1912), No. 12, pp. 292–297, figs. 25*).—The details of a hot water heating system satisfying greenhouse requirements, and consisting of 2-in. wrought iron pipe coils in sufficient quantity to maintain an average temperature of 60° F. in a total heating space covering some 6,000 sq. ft., are presented.

RURAL ECONOMICS.

Work accidents and the farm hand, D. D. LESCOHIER (*Survey, 27 (1911), No. 1, pp. 946–951, figs. 4*).—This article discusses and illustrates the economic significance of farm accidents. It shows that much of the machinery used on the farm is more dangerous than that used in most factories, since the public has not known enough about the number, causes, and consequence of accidents on farms to realize that farm workers need legal protection against unguarded machinery as badly as do factory workers.

A table itemizing the 135 agricultural accidents in Minnesota for a period of 20 months is given. Of these accidents 16 were fatal, and 9 involved the loss of an arm, 10 of a hand, 42 of one or more fingers, and 1 each of a foot, a leg, or both eyes. There were also 16 breaks and fractures, 16 serious and 7 severe crushings, and 13 serious and 9 severe lacerations.

Possibilities of American farms.—A comparison with Germany, E. MERRITT (*Tribune Farmer [N. Y.], 11 (1912), No. 570, p. 2*).—The author considers it inexpedient to attempt to reach Germany's standard of production in this country at present, and discusses the differences in conditions. "As soon as the increase in population creates a demand, our farmers will increase their production to meet it."

The high cost of farming, B. F. YOAKUM (*World's Work, 24 (1912), No. 5, pp. 519–533, figs. 18*).—This is the first of a series of articles discussing the causes of an alleged decrease in the purchasing power of the dollar in America from 100 cts. to 70 cts. during the last 15 years as compared with a decrease in England from 100 cts. to 78 cts., and a still smaller contraction in Germany. The causes assigned are the excessive burden of interest charges on farm loans because of inadequate money-lending facilities, the excessive cost of selling and delivering farm products to the consumer, the excessive cost of cartage from the farm to the railroad because of poor roads, and the need for more and better railroads.

The author discusses each item in detail, showing the cost of these deficiencies, the steps taken in other countries to eliminate them, and the steps needed in America to that end. As an illustration of one difficulty under which the American farmer does business, it is stated that whereas the United States Government can borrow money for $20 per annum per $1,000, and New York call loans command $24.60, commercial paper in the United States $41.10, French farms $43, German farms $44, the best public utilities or New York

mortgages $50, average American industries $65, and Arab farms in Egypt $80, the rate paid on the average American farm is $85.

Cheap money for farmers, J. W. WARD (*Grain Growers' Guide, 4 (1912), Nos. 38, pp. 7, 21, 22, 30; 39, pp. 8, 13, 14*).—This is a series of articles discussing and outlining a system of government loans for the farmers of western Canada based on the experience of Australia, New Zealand, and Germany. It is proposed that the provincial governments, upon the credit of the Provinces, borrow on the market at 4 per cent, allow 1 per cent for the cost of administration, and loan the money to farmers at 5 per cent, the initial expenses in the way of inspecting the property which is to be security for the loan, the drawing of mortgages, etc., to be borne by the borrower. It is suggested that the loans be limited to about 50 per cent of the value of the property on which they are to be secured, except that, in the case of homesteaders who have not earned their titles, provisions might be made to advance them a certain proportion of the value of the improvements which they have made.

Agricultural cooperation in Switzerland (*Tribune Farmer* [*N. Y.*], *11 (1912), No. 570, p. 5*).—This is stated to be one of a series of reports from American diplomats abroad regarding farmers' cooperative systems of various countries.

It is shown that one of the principal purposes of the Swiss Farmers' Association, which is represented in the Swiss National Council, is to regulate to a large extent the prices of milk and other agricultural products in the interest of the farmer. Similar associations with the same principles and purposes have also been established in the various cantons (States) and are members of the Swiss Farmers' Association. Besides these there are a number of local cooperative societies which have for their purpose the purchasing of seed, fertilizers, etc.

The federal government contributes annually 25,000 francs to the expenses of the central bureau maintained by the Swiss Farmers' Association. In the various cantons provisions are also made to facilitate loans to farmers through government mortgage banks, the chief advantage of which is that the farmer does not have to repay the loan in a single payment and he is practically relieved from the danger of foreclosure of his mortgage. Financial aid may also be rendered by municipal, cantonal, and federal authorities to undertakings which have for their purpose the improvement of the soil in the way of irrigation, drainage, road making, fencing, etc.

Institutions for agricultural credit (*An. Statis. Românici, 1912, pp. 176–245*).—Statistical tables are here presented giving detailed accounts of the condition and growth of agricultural credit societies; the status and extent of the loans; and the establishment, work, and progress of rural banks; together with other data relating to the many phases of agricultural credit in Roumania.

Cooperative agricultural distribution and production (*Bd. Trade* [*Gt. Brit.*], *Abs. Labor Statis. United Kingdom, 15 (1912), pp. 248–253*).—Tables are given presenting a general summary as to the number and total sales of cooperative societies in the United Kingdom engaged in agricultural distribution and production in each of the years 1896–1910, distinguishing the classes of societies. Other tables show capital, amount of land, sales, etc., of the cooperative small holdings and allotments societies in each of the years 1908–1910, together with the number of cooperative credit associations, members, capital, amount of loans granted, and other particulars for the years 1901–1910.

Small holdings, E. J. CHENEY (*Bd. Agr. and Fisheries* [*London*], *Ann. Rpt. Proc. Small Hold. and Allot. Act* [*etc.*], *1911, pp. 99*).—The data here reported have been previously noted (E. S. R., 27, p. 592).

A handbook of Virginia, G. W. KOINER (*Richmond, Va.: Dept. Agr. and Immigr., 1911, 4. ed., pp. 272, pl. 1, figs. 87*).—This publication shows the agricultural resources, as well as the agricultural and industrial development, of Virginia during the last decade. It is noted that the value of farm crops produced in the State increased from $129,000,000 in 1900 on 4,000,000 acres to $236,000,000 in 1910 on 3,300,000 acres.

[Agricultural products and resources of Mexico] (In *Mexico: A General Sketch. Washington, D. C.: Pan American Union, 1911, pp. 80–158, pl. 1, figs. 29*).—This publication presents along with other data a compilation as to the extent and character of the agricultural products and resources, timber and timber products, stock raising, mining, other industries, etc., of Mexico.

Agricultural progress in Trinidad and Tobago, CARMODY (*Dept. Agr. Trinidad Bul., 11 (1912), No. 70, pp. 15–23*).—An address delivered at the West Indian Agricultural Conference held at Trinidad January 23–30, 1912, in which the author points out the many directions in which progress has been made in the colony. Statistics are given comparing the principal agricultural exports for the years 1895–1900, 1903–4, and 1910. The principal crops, named in the order of their importance, are cacao, sugar, coconut, rice, and coffee. The value of exported cacao amounted in 1910 to £1,230,097.

Agricultural statistics, 1911, R. H. REW (*Bd. Agr. and Fisheries [London], Agr. Statis., 46 (1911), No. 1, pp. 97, fig. 1; abs. in Jour. Roy. Agr. Soc. England, 72 (1911), pp. 409–418*).—A report presenting notes and statistics as to the acreage and live stock returns of Great Britain, with summaries for the United Kingdom.

The total land area of Great Britain is reported for 1911 as 56,214,419 acres, of which 32,094,658 acres are returned as cultivated area, a decrease of 51,272 acres as compared with 1910. During the last 10 years the reduction of the cultivated area has amounted to 323,000 acres.

The agricultural holdings containing from 1 to 5 acres numbered 108,552 in 1910, and 110,596 in 1911; those containing from 5 to 50 acres numbered 232,585 in 1910, and 234,040 in 1911; the farms having from 50 to 300 acres numbered 151,102 and 151,197 in 1910 and in 1911, respectively; and the number containing over 300 acres is reported at 17,426 in 1911, as compared with 17,569 in 1910. Of the total number of holdings 60,217, or 1.73 per cent, are operated by the holders, and 43,239 of these are holdings from 1 to 50 acres.

Tables are given, showing the acreage under crops and grass and the number of live stock in each division of Great Britain in 1911 and 1910; number of holdings farmed; acreage under orchards; and the different kinds of small fruits, other crops, etc., for each county in 1911.

Agricultural statistics (*Statis. Jahrb. Schweiz, 20 (1911), pp. 40–57*).—An official report giving agricultural statistics of Switzerland by cantons, showing the area in cultivation, the average and total yields, value, etc., of the leading crops, the production, value, etc., of dairy products, and other agricultural data for varying periods.

Foreign crops, July, 1912, C. M. DAUGHERTY (*U. S. Dept. Agr., Bur. Statis. Circ. 39, pp. 15*).—This circular presents notes and statistics as gathered from reports of various foreign countries regarding crop conditions, area, production and estimated yields of foreign crops, 1911–12, with comparisons; together with statistics as to imports of wheat and wheat flour into Belgium, 1906–1911; and imports of cotton into European and Asiatic Russia, 1906–1910.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 14 (1912), No. 8, pp. 57–64, fig. 1*).—Notes and other data showing crop conditions August 1, 1912, with comparisons are here presented; also receipts at and exports of durum wheat from the principal United States ports 1908–1912; farm value of

important products by States and on various dates; farm marketing and prices of wheat by months; value of the foreign trade of the United States, 1903–1912; hay, temperature, and precipitation statistics; average world production of important agricultural products; production of sugar and sugar cane in the Territory of Hawaii, 1910–11; and range of prices of agricultural products at important markets.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 14 (1912), No. 9, pp. 65-72, fig. 1*).—A report showing crop conditions September 1, 1912, with comparisons, is given; likewise data as to the monthly receipts and stocks of eggs and poultry in the United States; farm value of important products on dates indicated; average condition of all crops, by States; average condition of specified crops, United States; temperature and precipitation statistics; farm value of important crops; imports of farm and forest products; monthly movements of grain from farms; and the range of prices of agricultural products at important markets.

The total cotton ginned in the various States up to September 1 was 729,926 bales for 1912, as compared with 771,297 for 1911, 353,011 for 1910, and 388,242 for 1909.

AGRICULTURAL EDUCATION.

The university ideal, A. M. SOULE (*Athens, Ga., 1912, pp. 20*).—This is a discussion of the origin, rise, and influence of the American university system, considering such functions of a university as the maintenance of a graduate school, leadership in public affairs, and extension work.

Educational culture for the people of Manitoba, J. W. ROBERTSON ([*Winnipeg: Univ. of Manitoba*], *1912, pp. 8*).—This address, given at the convocation of the University of Manitoba, makes a strong plea for such further reorganization and reconstruction of "courses" and "time tables" in schools, colleges, and universities as will insure a full measure of an educational culture as suitable for the fundamental vocations or occupations as the formal education of the recent past has been for the learned professions.

Report of agricultural extension department, E. S. RICHARDSON (*Univ. Bul. La. State Univ., n. ser., 3 (1912), No. 6, pt. 1, pp. 16*).—A report of the work accomplished by the department since its organization in 1909.

Something of the district agricultural schools (*Farmers' Union Sun, 14 (1912), No. 26, pp. 3, 4*).—A popular description of the work at the Statesboro Agricultural School of Georgia, which last season had an enrollment of 253 pupils, 50 of whom were girls. The boys do all the farm work, each student being required to put in 9 hours a week on the farm and 4 in the shop, and being paid by the hour for all additional time. The same principle is applied in the girls' department.

Report of agriculture in the high schools of Michigan, W. H. FRENCH (*Mich. Agr. Col., Dept. Agr. Ed. Bul. 8, 1912, pp. 23, figs. 15*).—This report gives the plans and purposes of the work and what has been accomplished up to the present time. A statistical table shows the enrollment in agricultural classes, expenses for instruction, and the character of the extension work.

High schools that train for farming, C. W. WARBURTON (*Country Gent., 77 (1912), No. 31, pp. 7, 24, fig. 1*).—This is an account of how Minnesota schools are adapted to the needs of country pupils.

Country schools for city boys, W. S. MYERS (*U. S. Bur. Ed. Bul., 1912, No. 9, pp. 22, pls. 5*).—A few of the results thus far obtained from the establishment of a country school for city boys at Baltimore, Md., and other places are given. The movement has been supported entirely by private means.

Preparation of teachers for rural work, A. C. MONAHAN (*Winthrop Norm. and Indus. Col. S. C. Bul., 5 (1911), No. 1, pp. 32–40*).—The author maintains that, in the future, economy and efficiency will force the number of one-room district schools to decrease constantly and the number of consolidated or centralized schools, to which the pupils are transported at public expense, to increase greatly; that agriculture, home economics, prevention of diseases, sanitation, and good citizenship should be included in the curriculum; and that the teacher become a permanent part of the community. Although the teacher need not be an expert farmer, housekeeper, doctor, or nurse, she should be well enough informed in these subjects to teach their elements and to aid in the direction and arrangement of more complete instruction for adults.

The rural school, F. S. COOLEY (*Bul. Mont. State Col. Agr., 9 (1911), No. 2, pp. 20*).—This bulletin contains, among other things, suggestions for rural teachers and others who are interested in developing plans to assist the schools in the discharge of their full function as an agency for country betterment.

The organization of correspondence courses in agriculture, J. HAMILTON (*Proc. Assoc. Amer. Agr. Cols. and Expt. Stas., 25 (1911), pp. 186–193*).—The author outlines a plan of extension teaching by the correspondence method, in which he suggests the formation of classes of not more than 15 persons to meet daily from 8 a. m. to 4.30 p. m. for a limited period, under the direction of a leader. The leader would in most cases be a layman residing in the neighborhood, and should be appointed by the extension department of the agricultural college. His main business would be to see that the students did the required work, to conduct quizzes, assist students in reference work, oversee the practicums, have charge of apparatus and materials for laboratory work, keep records, and make reports. The course of study should be printed in detail and should be upon a single topic for each class organized. Suggestions are given for the various details of conducting classes in this way, for summer schools for training class leaders, and for the organization of the necessary office force.

Opportunities in the government service, D. S. BURCH (*Wis. Country Mag., 6 (1912), No. 4, pp. 11–14*).—In this discussion, the term "government service" refers to work in the U. S. Department of Agriculture.

State aid to agriculture in Ireland, H. PLUNKETT (*Jour. Roy. Agr. Soc. England, 72 (1911), pp. 37–61*).—This is a detailed account of the administration of state aid for agricultural instruction in Ireland, dealing chiefly with the policy and work of the Department of Agriculture and Technical Instruction for Ireland.

Statistics of education in the Kingdom of Wurttemberg for 1911 (*Statis. Unterr. u. Erziehungsw. Kgr. Württemb., 1911, pp. 64*).—Information is given for 1911 similar to that for 1910 previously noted (E. S. R., 27, p. 695).

School agriculture, M. N. Wood (*New York and London, 1912, pp. XV+339, pls. 14, figs. 180*).—This book is intended for classes in rural and graded schools, and includes most of the principles of general agriculture. Experiments and a suggestive list of reference books follow each chapter. Considerable attention is given to illustrations developing the different topics.

A tentative course of study in the subject of agriculture for the elementary schools of the State of Ohio for the year 1911–12, F. W. MILLER ET AL. (*Columbus, Ohio: [Dept. Ed.] 1911, pp. 11*).

Lessons from forest and orchard, A. W. NOLAN (*Agr. Col. Ext. Univ. Ill. [Circ.], 1912, July, pp. 35, figs. 16*).—Six lessons in forestry and 7 in orchard management are presented, also practical exercises to be correlated with the school work in nature-study and elementary agriculture.

The renewal of the neglected orchard, C. S. WILSON (*Cornell Reading-Courses, Fruit Growing Ser., 1912, No. 1, pp. 173–180, figs. 5*).—Directions of

general application are presented. A supplement contains 11 suggestive questions for the teacher in orchard management.

Elementary entomology, E. D. SANDERSON and C. F. JACKSON (*New York, Chicago and London, 1912, pp. V+372, figs. 496*).—This work has been prepared as a text-book for beginners in entomology. Parts 1 (pp. 5–66) and 2 (pp. 67–274), by the senior author, deal with the structure and growth of insects and with the classes of insects. Part 3 (pp. 275–358), by the junior author, is devoted to laboratory exercises.

Notes in agricultural arithmetic, C. A. WHEELER (*Storrs, Conn., 1912, pp. 77, figs. 104*).—In the development of this subject, the author has made use of grades to give practice in percentage; of scales and free-hand lettering forms to encourage neatness in the students' work; and of isometric projection. The contents include chapters on foods, fertilizers, and painting.

Cement silo construction, G. S. HINE and G. C. WHEELER (*Agr. Ed. [Kans. Agr. Col.], 4 (1912), No. 6, pp. 79, figs. 29*).—This publication gives data on building solid-wall and metal-lath silos.

Civic improvement in village and country, F. A. WAUGH (*Facts for Farmers [Mass. Agr. Col.], 2 (1912), No. 12, pp. 4*).—A suggestive outline of work for those interested in community betterment.

Public schools and community life, E. L. HOLTON (*Vocational Ed., 1 (1912), No. 5, pp. 351–354*).—The author points out the necessity for the redirection of schools toward the home, farm, shop, and higher levels of community life, not theoretically but practically, and cites what is being done in Kansas through improvement clubs in several hundred rural neighborhoods, the teaching of agriculture in more than 7,000 rural schools and about 450 city and village schools, and of home economics in about 700 rural schools and 200 village and city schools, one-day agricultural fairs in rural and village schools, and short winter courses for farmers and farmers' wives in several county high schools and one or two city schools. The program of a rural school improvement meeting is given, as is also an outline of a 2-year course followed in a high school in Wisconsin.

The text-book of agricultural education and rural life: Boys' and girls' agricultural clubs, T. W. HORTON (*Columbus: Ohio Assoc. Adv. Agr. Ed. [1912], pp. 20, figs. 6*).—The author states that boys' and girls' agricultural and domestic science clubs offer a most useful means of solving the problem of giving boys and girls an opportunity to put into actual practice in the soil or in the house the lessons learned in the school, and also giving useful vacation work to connect the school and home life. An account is given of a club organized in March, 1911, in Scioto Township, Pike County, Ohio.

The school-home garden, E. C. BISHOP (*Nature-Study Rev., 8 (1912), No. 5, pp. 169–172*).—According to the author, in schools where vacation work is not practicable, the mission of the school garden should be (1) as an experimental plat for the study of germination of seeds and root and stem development so far as is possible when school is in session; (2) for the growing of vines and shrubs, which may help to cover or shield the view of outbuildings and form a part of the schoolground landscape work; (3) for the growing of such other plants as may be given a start in the spring, and by mulching or other prearranged care during the summer, blossom or bear results at the fall opening of school; and (4) as an experimental or demonstration garden on a small scale, to create an interest that will impel pupils to plant gardens of their own at home.

West Virginia Arbor and Bird Day manual (*Charleston, W. Va.: Dept. of Schools, 1912, pp. 78, pls. 16, figs. 15*).—This contains suggestions and material for the observance of the day.

Arbor Day in Porto Rico (*San Juan, P. R.: Dept. Ed., 1911, pp. 47*).—This pamphlet, published in English and in Spanish, contains a program and other material for the celebration in the public schools of Porto Rico of Arbor Day, which occurs on the Friday following the last Thursday in November.

Farmers' institutes in Pennsylvania, compiled by A. L. MARTIN (*Penn. Dept. Agr. Bul. 214, 1911, pp. 82*).—This bulletin contains information for institute managers and program committees on institute work in Pennsylvania, and other data.

MISCELLANEOUS.

Twenty-second Annual Report of Mississippi Station, 1909 (*Mississippi Sta. Rpt. 1909, pp. 14*).—This contains the organization list, a financial statement for the federal and sales funds for the fiscal year ended June 30, 1909, and for the substations for the period from May 16, 1908, to April 23, 1909, and a report by the director on the work of the station during the year.

Twenty-third Annual Report of Mississippi Station, 1910 (*Mississippi Sta. Rpt. 1910, pp. 12*).—Data corresponding to the above are given for the period ended June 30, 1910.

Annual Report of Porto Rico Station, 1911 (*Porto Rico Sta. Rpt. 1911, pp. 44, pls. 4*).—This contains the organization list, a summary by the Special Agent in Charge of the investigations conducted at the station during the year, and separate reports by the chemist, horticulturist, assistant horticulturist, entomologist, pathologist, and animal husbandman. The experimental work reported is for the most part abstracted elsewhere in this issue.

Partial bibliography and index of the publications of the college of agriculture and the agricultural experiment station (*Missouri Sta. Bul. 105, pp. 19*).—This comprises a bibliographical list and index to Farm Bulletins 1 to 35 of the college of agriculture, and the following publications of the station: Bulletins 1 to 82, Circulars 1 to 45, and the Reports of the Director from 1888 to 1903.

Experiment Station Work, LXX (*U. S. Dept. Agr., Farmers' Bul. 504, pp. 24, figs. 3*).—This number contains articles on the following subjects: Improvement of sandy soils—growth of forage crops, utilization of roughage, fattening lambs on alfalfa and corn, box for feeding alfalfa hay to swine, cooperative herd testing, cooperative cattle breeding, losses due to low-grade cream, lessening danger from poisoning by arsenical dips, and care of farm machinery.

NOTES.

Connecticut Stations.—Director E. H. Jenkins, of the State Station at New Haven, has been appointed director of the Storrs Station. The board of managers, the funds, and the work of both stations will be separate as in the past, but a single director will administer both stations.

Delaware College.—A summer school for teachers, giving instruction in agriculture and home economics, is to be held in 1913, the State Board of Education having recently required the teaching of these subjects in the public schools beginning next fall.

Kansas College.—A secondary school of agriculture, mechanic arts, and home economics is to be established next fall to articulate with the eighth grade of the public schools. A three-year course will be offered, with a fourth year for those desiring to enter the college. The present subfreshman course is to be abolished and the entrance requirements raised to 15 units.

Massachusetts Station.—H. D. Goodale, a specialist in zoology and since 1911 employed by the Carnegie Institution of Washington in its department of experimental evolution, has been appointed research biologist in the department of poultry husbandry. He will begin his duties February 1, 1913.

Minnesota University and Station.—Dr. E. M. Freeman has been appointed assistant dean. G. W. Paterson has succeeded J. B. Lamson as assistant in rural school work. Other appointments include J. H. Allison as professor of forestry, F. A. Corniea instructor in the school of agriculture, Florence Secor instructor in domestic art, and Charles L. Lewis assistant in drainage investigations. Stephen Anthony has been given leave of absence as chemist in animal nutrition.

Porto Rico Sugar Producers' Station.—A meeting was recently held at Fajardo, on the eastern side of the island, for the discussion of irrigation problems. This has been a very dry year and even plantations on the north and east coasts, which usually have sufficient rainfall for sugar cane, have suffered to such an extent that the establishment of irrigation works is being seriously considered. An irrigation engineer of the Department of the Interior was present at the meeting and discussed the engineering features of the problem, and much interest in the subject has been aroused.

Tennessee University and Station.—The State Veterinary Medical Association met at the university November 20 and 21 for the first time. The program included a practical demonstration of the vaccination of hogs against cholera. A resolution was passed favoring an appropriation by the State for the establishment of a hog cholera serum plant in connection with the university and station.

A corn exhibit was held November 23, on the station farm, by the boys' corn clubs of eastern Tennessee. There are clubs in 16 of the 34 counties, and the membership numbers about 600. Prizes are awarded valued at $500, besides local prizes valued at approximately $3,000 additional.

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